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101

Highly Enriched Uranium Working Group Report

on

Environmental, Safety and Health Vulnerabilities Associated with the Department's Storage of Highly Enriched Uranium

Volume II: Number 8

Oak Ridge National Laboratory

Working Group and Site Assessment Team Reports

U.S. Department of Energy

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Highly Enriched Uranium Working Group

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U.S. DEPARTMENT OF ENERGY

HIGHLY ENRICHED URANIUM ES&H VULNERABILITY ASSESSMENT

WORKING GROUP ASSESSMENT TEAM REPORT

OAK RIDGE NATIONAL LABORATORY

August 1996

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LOCKHEED MARTIN

August 21, 1996

Mr. Frank Chen
Department of Energy, EH-34
19901 Germantown Road
Germantown, Maryland 20874

Dear Mr. Chen:

Classification Review of a Document

I have reviewed for classification the June 14, 1996, draft version of a report entitled *Department of Energy Highly Enriched Uranium ES&H Vulnerability Assessment, ~~King~~ Working Group Assessment Team Report, Oak Ridge National Laboratory.* The report is unclassified.

Sincerely,

Arvin S. Quist

Arvin S. Quist, Classification Officer
Oak Ridge National Laboratory

ASQ:vb

c: D. R. Hamrin
File-K25CO-RC

HIGHLY ENRICHED URANIUM (HEU)
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ACRONYMS

ALARA	As Low As Reasonably Achievable
BIO	Basis for Interim Operation
CSA	Criticality Safety Analysis
DOE	Department of Energy
ES&H	Environment, Safety and Health
HEPA	High-Efficiency Particulate Air (filter)
HEU	Highly Enriched Uranium
HVAC	Heating, Ventilating, and Air Conditioning
MBA	Material Balance Area
MSRE	Molten Salt Reactor Experiment
NDA	Nondestructive Assay
ORNL	Oak Ridge National Laboratory
OSR	Operational Safety Requirement
RCT	Radiological Control Technician
RCRA	Resource Conservation and Recovery Act
SAR	Safety Analysis Report
SARUP	Safety Analysis Report Upgrade Program
SAT	Site Assessment Team
SNM	Special Nuclear Material
SWSA	Solid Waste Storage Area
TRL	Transuranium Research Laboratory
VAF	Vulnerability Assessment Form
WEAF	Waste Examination and Assay Facility
WGAT	Working Group Assessment Team

EXECUTIVE SUMMARY

This is the report of a visit to the Oak Ridge National Laboratory (ORNL) by a Working Group Assessment Team (WGAT) to assess highly enriched uranium vulnerabilities. Purposes of the visit were: to review results of the sites' self-assessments of current practices for handling and storing HEU; to conduct an independent assessment of these practices; to reconcile differences and assemble a final list of vulnerabilities; and to issue a report to the Working Group. This report, representing completion of the ORNL visit, will be compiled along with those from all other sites with HEU inventories as part of a final report to the Secretary of Energy.

Another objective of the visit by the WGAT was to inform the public and local stakeholders of the project's mission, its methods, and the specific results of the ORNL assessment. To this end, an "Exit-Briefing" in conjunction with the Y-12 "In-Briefing" was held on June 17, 1996, at the conclusion of the visit to report preliminary results. This meeting was announced publicly and was readily accessible to the public. Questions from the public were addressed at the briefing. This report contains an accounting of this meeting in Appendix E.

The Site Assessment Team (SAT) had conducted its self-assessment and a draft report of their findings were made available prior to the visit by the WGAT. In a review of this self assessment, the WGAT found the SAT report generally adequate, but requiring some clarification of details. Discussions with the SAT leaders identified specific omissions and unclear question set answers which needed clarification/correction by the SAT. Also, internal review by ORNL and DOE managers, as well as corrective actions based upon the assessment, necessitated some updates to the draft report. The SAT identified 15 facilities which contained in-scope material and WGAT walkdowns were conducted for those facilities that had potential vulnerabilities and a sampling of other facilities to validate the thoroughness of the SAT review. Team members interviewed a number of workers and managers, and discussed observations with cognizant members of the SAT.

The ORNL site has a large number of buildings containing relatively small amounts of HEU. It was recognized early that the entire Working Group Assessment Team (WGAT) could not walkdown and assess all buildings. Thus, an evaluation of the contents of each building was undertaken to support decisions on optimum use of the time and effort of the WGAT members in gaining proper and valid insight into the true HEU vulnerabilities.

Some safety analysis documentation had been provided to the WGAT for review prior to the site visit. The Molten Salt Reactor Experiment (MSRE) contains significant amount of U-233 in the facility. Since it was assessed during the spent nuclear fuel vulnerability assessment, the SAT team considered MSRE out of scope for the HEU assessment. The WGAT team believes the MSRE is the facility that has the highest potential for HEU vulnerabilities for the ORNL site. A tour of the MSRE was performed at the request of the WGAT. The WGAT concludes that the remedial action is well underway to eliminate the vulnerabilities associated with MSRE.

Building 3019 was viewed by the WGAT as having the next highest potential for HEU vulnerabilities on the ORNL site because of the large quantity of uranium-

233 stored in the building. The Nuclear Material Storage Vault-Building 3027 contains nearly all of the remainder of the total in-scope HEU at ORNL. The remaining buildings with HEU have much smaller quantities of HEU.

The WGAT is concerned that the 15,000 liters of thorium nitrate solution, containing 130 g of U-233, is being retained and used as neutron poison for waste solutions containing plutonium. This does not seem to be an appropriate disposition of this material since this method will take many years. This material has not been declared a waste because of this use and consequently has not been characterized. If the pH of this solution is less than 2.0 and it were considered a waste, it could be subject to RCRA permitting. Continued storage indefinitely of this material in a deteriorating single shell tank is the concern. A plan should be prepared to prevent spillage due to aging of equipment.

The ORNL SAT had initially identified eight potential "vulnerabilities" during their assessment. As a result of proactive disposition of two potential vulnerabilities, and following detailed discussions between the SAT Leaders and the WGAT about duplication in one potential vulnerability, the SAT decided to remove three vulnerabilities from their report.

The WGAT identified a variant of one SAT vulnerability, which has been included in this report. This vulnerability has high potential for more severe consequences to workers, but not to the environment or public. With implementation of additional engineered systems, the consequences will be significantly reduced.

The six potential vulnerabilities identified for the ORNL site are:

ORNL/Generic/SAT/001: Seismic and Wind Capacity for ORNL Structures Have Not Been Evaluated

ORNL/B3019/SAT/001: Material Release in Storage Wells from Aging/Corrosional Breach of Packaging

ORNL/B3019/SAT/002: Potential Loss of Building Integrity, Chimney Stack, and Failure of HEPA Filter Equipment and Ventilation Lines During an Earthquake or High Wind Event

ORNL/B3019/SAT/003: Spill of Material from P-24 Tank

ORNL/B3019/SAT/004: Loss of Material in P-24 Tank Due to Earthquake, Tornado, or Other Disaster Scenario

ORNL/B3019/WGAT/001: Failure of U-233 Oxide Can During Handling

1.0 INTRODUCTION

The objective of the Highly Enriched Uranium (HEU) Environment, Safety and Health (ES&H) Vulnerability Assessment at the Oak Ridge National Laboratory (ORNL) was to conduct a comprehensive assessment of the ES&H vulnerabilities arising from the storage and handling of its current HEU holdings. The term "ES&H Vulnerability" is defined for the purpose of this project to mean conditions or weaknesses that could lead to unnecessary or increased radiation exposure of workers, release of radioactive materials to the environment, or radiation exposure to the public. This assessment was intended to take a "snap-shot" of ORNL's HEU holdings and associated ES&H vulnerabilities in the time frame of June 1996. This vulnerability assessment process began with the ORNL Site Assessment Team (SAT) generating a self-assessment report including proposed vulnerabilities. The SAT identified 15 facilities containing HEU which they considered might be in-scope for purposes of this study. The Working Group Assessment Team (WGAT) performed an independent assessment of the SAT report, conducted facility walkdowns, and reviewed reference documents such as Basis for Interim Operation (BIOs), Operational Safety Requirements (OSRs), emergency preparedness plans, and procedures. The results of the WGAT review and "walkdowns" (a term as used here incorporating visiting locations of HEU material storage/use, document reviews, and detailed discussions with cognizant personnel) are discussed in Section 4.0. The ES&H vulnerabilities that were identified are documented in Appendix B

2.0 METHODOLOGY OF ASSESSMENT

The ORNL SAT in preparing the SAT report responded to the question set, identified and performed walkdowns of their facilities, observed facility conditions, identified HEU inventories, and evaluated facility authorization bases. Using this information, they performed barrier-consequence analyses, evaluated potential ES&H vulnerabilities, and created Vulnerability Assessment Forms as appropriate.

The ORNL WGAT performed walkdowns of the facilities, verified and validated SAT information, and identified additional vulnerabilities, if appropriate.

The ORNL site has several buildings containing relatively small amounts of HEU. It was recognized early that the entire WGAT could not tour and assess all buildings. Thus, an evaluation of the contents of each building was undertaken to support decisions on optimum use of the time and effort of the WGAT members in gaining proper and valid insight into the true HEU vulnerabilities.

The buildings were screened on the basis of similarity of features and HEU quantities. It was decided that the entire WGAT team would visit eight buildings. These buildings contain nearly all of the total in-scope HEU at the ORNL site. Instead of a very brief review of safety analysis documentation for each facility, a more in-depth review of the most important documents for these key buildings was performed. Of these eight facilities, Building 3019 was viewed by the WGAT as having the highest potential for HEU vulnerabilities because of the quantity of HEU present.

3.0 FACILITIES LIST

HEU facilities at the Oak Ridge National Laboratory are as follows:

Building 3019: This building houses the National Repository for U-233 and also stores a large quantity of U-235, the vast majority of which is commingled with about one-fourth of its U-233 holdings. Designed as a pilot plant for development and demonstration of nuclear fuel reprocessing, this facility has primary confinement, secondary confinement, storage wells, and laboratory areas.

Building 3027: This building is used for the receipt and storage of nuclear materials.

Buildings 3036 and 7001A: These buildings are used for receipt, shipment, and storage of transit nuclear materials, but currently have no HEU stored inside.

Building 3500: This building contains offices, shops, and laboratories for instrumentation R&D. One laboratory is used for the development of neutron detectors (fission chambers) and contains a small amount of HEU as source material.

Building 3508: This building also contains offices, shops, and laboratories for instrumentation R&D. One laboratory is used for the development of neutron detectors (fission chambers) and contains a small amount of HEU as source material in a negative pressure vault.

Building 3525: This building is a hot cell facility used for the examination, testing and evaluation of materiale radiatio [illegible]

Building 4501: This building contains offices, shops, laboratories, and hot cells for nuclear fuel cycle and reactor safety R&D. It has less than 2 g of HEU including some U-233 in many small containers of dilute solutions or residues.

Building 5505: This building, known as the Transuranium Research Laboratory, is an office and laboratory building used by scientific/technical personnel to conduct experiments with various isotopes of the transuranic elements. It has 27 g of HEU as sources or samples in 10 packages.

Building 6010: This building houses the Oak Ridge Electron Linear Accelerator used for basic and applied physics research. It has 236 g of HEU stored in two-hour fire rated Mosler safes in the basement.

Building 7710: This building is a general purpose facility with offices, labs, and other special purpose rooms. Its principal activity is the use of sealed sources to develop improved methods of measuring radiation fields and radioactive contamination. It has 12 fission chambers containing 20 g of HEU stored in a vault.

Building 7824: This building, known as the Waste Examination and Assay Facility, is primarily used to perform nondestructive examination and assay of the contents of waste containers. It is also in R&D on pulsed neutron, gamma, and x-ray detection applications. It has 18 g of HEU as sources or metal foil.

Building 7930: This building is glove box, hot cell, and laboratory facility [illegible]

Building 9201-2: This building, located at the Y-12 Plant, is a fusion energy research facility. It contains 48 g of HEU in fission chambers and source material.

Building 9204-3: This building, also located at the Y-12 Plant, is a Calutron facility currently used for the electromagnetic separation of stable isotopes. It has a contained facility which was used for the separation of actinide isotopes but is now in safe standby condition. It has 242 g of HEU primarily as metal or oxides stored in three areas.

A summary of ORNL facilities with in-scope HEU and their holdings is shown in Table 3.1.

Table 3.1 - Oak Ridge National Laboratory HEU Facilities

Building	HEU Holding(g)	U-233 Holding(g)
3019	796,410	423,605
3027	633	16
3500	71	
3508	97	
3525	130	1
4501	2	<<1
5505	27	
6010	236	
7710	20	
7824	18	
7930	16	
3036 & 7001A	0	
9201-2	48	
9204-3	242	

4.0 EVALUATION OF SAT REPORT AND SAT IDENTIFIED VULNERABILITIES

This section describes activities of the WGAT at the ORNL. It concludes with a summary of the several ES&H vulnerabilities identified by the SAT and the WGAT.

As defined in the Project Plan, the SAT was charged with the responsibility of conducting a HEU vulnerability assessment of the ORNL and drafting a report of the results. When the draft report was complete, the WGAT reviewed the draft report, visited the site, conducted walkdowns of identified facilities, and participated in joint discussions with individual SAT members to understand fully their conclusions and to generate a final, revised set of vulnerabilities.

As the first order of business, the leadership of both teams conducted an In-Briefing at the Audit Center in Building 2001 for Facility Managers.

Subsequently, an extensive array of walkdowns, interviews, and document reviews were facilitated for the WGAT by the SAT representatives. The overall results of the ensuing assessments are reported building by building in the remaining sections of this chapter.

The SAT identified one site-wide institutional vulnerability (ORNL/Generic/SAT/001, Seismic and Wind Capacity for ORNL Structures Not Evaluated). Although no analysis of ORNL structures in accordance with the current DOE Standard, DOE-STD-1020-94, exists to show that a material release due to Natural Phenomena Hazards is incredible, the small holdings of HEU and U-233 in facilities other than Building 3019 would make any release consequences very low. The vulnerabilities of NPH events for Building 3019 are identified below and their consequences evaluated.

The WGAT reviewed the site assessment question set for each building in depth and discussed with the SAT leaders where information was missing or otherwise lacking in depth or detail. The

this conclusion. The WGAT walkdown of the facility supported the SAT report relevant to criticality safety.

The SAT initially identified five specific vulnerabilities for this facility, but combined two of the vulnerabilities upon discussion with the WGAT. Discussion of each of these vulnerabilities follows:

Vulnerability ORNL/B3019/SAT/001 - Material Release in Storage Wells from Aging/Corrosional Breach of Packaging

This vulnerability is due to the failure of an HEU can in a storage well from aging/corrosion. While to-date no can failures have been observed, some of these packages are approaching 30 years of age, and their condition has not been observed since initial storage. Some hold fluorine compounds which can degrade by radiolysis and cause severe corrosion in cans. The postulated material at risk is 1.3 kg of oxide powder and is an upper limit in dispersible material for a single package. The storage wells provide a robust barrier to such release but 10 percent of the released powder is assumed to reach the Vessel Off Gas system. Most of the effluent in this system is routed to an off-gas treatment building where it is scrubbed with caustic to remove acidic vapors and filtered through roughing and HEPA filters. These components are regularly checked for performance. This effluent is exhausted to the 3039 stack which is located about 100 meters east-southeast from Building 3019. In event of off-gas treatment failure or shutdown, VOG is also routed to the main Building 3019 ventilation system which provides HEPA filtration prior to discharge via the 3020 stack. Such a release could be expected to occur within five years in that some of the packages are approaching 30 years of age and have not been inspected. The potential cause and effects of this failure in barriers to release of the material was verified by the WGAT.

The WGAT validates this as a potential vulnerability due to the possible release of fluorides from some stored materials, presence of plastic in some packages, age of many of the packages, potential corrosion of the packages, and time since any of the stored materials have been inspected.

The DRAFT SAT Report identified another vulnerability (Draft Vulnerability ORNL/B3019/SAT/002), which involved the failure of a U-233 can in a storage well from fluorine generated by radiolysis causing an unpressurized release. This vulnerability was judged by the WGAT to be the same as 001, above, and the SAT was requested to combine the two vulnerabilities.

The WGAT identified an additional vulnerability related to this material and its packaging because of planned repackaging in the near future. This vulnerability is presented in Section 4.1 of this report as ORNL/B3019/WGAT/001.

Vulnerability ORNL/B3019/SAT/002 - Potential Loss of Building Integrity, Chimney Stack, and Failure of HEPA Filter Equipment and Ventilation Lines During an Earthquake or High Wind Event

This vulnerability arises from the failure of the HEPA filter equipment and the collapse of the building during a severe earthquake or extremely high wind. The facilities assumed to fail have not been analyzed per current DOE evaluation criteria. The postulated material at risk is 0.169 kg of U-233. This is the total amount of material located in places likely to be impacted by such a natural phenomena hazard (i.e., the labs). The WGAT agrees with the SAT that such a consequence would not be anticipated during the life of the facility. The WGAT verified the basis for the consequences of this vulnerability.

The WGAT validates this as a potential vulnerability due to the possibility for a large earthquake causing failure of important structures holding the U-233 material. The age of the facility and its construction to codes and standards differ from today's requirements. Until future analysis is performed, a prudent assumption for the very unlikely event of such an earthquake is that portions of the facility housing U-233 would collapse, material would be released into the ventilation system, and, at the same time, the ventilation system stack 3039 would fail (brick liner construction) and result in failure of the HEPA filter housings beneath it.

Vulnerability ORNL/B3019/SAT/003 - Spill of Material from P-24 Tank

This vulnerability involves the leakage of thorium nitrate solution from tank P-24, which contains 0.130 kg of U-233. This tank and its contents are inaccessible and leakage from a valve, pump, or piping could occur. If such a leak developed during transfer from the tank, a spill of solution could occur through a maximum distance of three meters. The consequences of the barrier failure were assumed to involve the entire contents of the tank (no operator intervention). The consequence of such a spill could be an environmental release, and the potential for exposures to workers and the public exists. The WGAT believes that such a consequence could be anticipated during the next five years. The SAT originally stated that such a consequence could not be anticipated during the facilifetime, but subsequently modified the vulnerability to agree with the ;AT. The potential cause and effect this failure were verified by the WG.

The WGAT validates this is a potial vulnerability due to the long resnce of this solution without direct inspen. While a monitored sump exists i level is monitored daily, no inspectior the integrity of the piping system an components has been performe

Vulnerability ORNL/B3019/SA[illegible] - Loss of Material in P-24 Tank [illegible] to Earthquake, Tornado, or Othe[illegible] Scenario

This vulnerability involves the fail[illegible] tank P-24 containing thorium nitra solution and 0.130 kg of U-233 du[illegible] an earthquake. This tank has not be analyzed per the current DOE eva[illegible] criteria. The consequence of such a spill could be an environmental release, and the potential for exposures to workers and the public exists. The WGAT agrees with the SAT that such a consequence could not be anticipated during the lifetime of the facility. The potential cause and effects of this failure were verified by the WGAT.

The WGAT validates this is a potential vulnerability due to the long residence of this solution in tank P-24 and the deficiency of the qualification of this tank to current seismic criteria. While a monitored sump exists and tank level is monitored daily, the operability of these systems may not be ensured following an earthquake.

4.2 Building 3027

Building 3027 is a one-story vault structure. The facility consists of an entry air lock, a receiving room, five storage rooms or cells, and a mechanical equipment room for electrical and ventilation equipment. Each room is kept locked. The building was specifically designed and constructed for the receipt, shipment, and storage of nuclear materials. All nuclear materials are received in closed, sealed containers, and are stored in the storage cells.

Completed in 1979, the vault is constructed of reinforced concrete 18 inches thick, with a 10-inch reinforced concrete roof. The vault was designed and constructed to withstand both a 0.15 g earthquake and a 360 mph wind.

The vault was constructed originally to store nuclear materials. No material processing is performed. Materials handling involves only the receipt and removal of closed containers.

Criticality Safety - Building 3027 contains a special nuclear material (SNM) storage vault (Room 107) containing 633 g of HEU. This facility was not visited for a walkdown by the ORNL WGAT, but the SAT Question Set was reviewed. Double contingency is applied to the HEU holdings to ensure criticality safety, and a nuclear criticality safety approval (CSA) document has been performed. The fissile material has been containerized such that a criticality accident is not credible for this facility.

4.3 Buildings 3036 and 7001A

Building 3036, known as the Radioactive Material Shipping and Packaging Facility, is a steel-framed and sheet-metal facility located in the center of the main ORNL complex. The current mission of the facility is to prepare radiological material for shipment to other DOE sites. HEU is shipped to this facility for packaging for DOT shipments offsite. The DOT package is forwarded to Building 7001A for pickup by the transportation carrier. The team did not visit the facility due to time constraints.

The design basis of the building structure is unknown and a seismic or high wind event could potentially collapse the building. While there was no HEU present in the facility at the time of the SAT assessment, the material will be packaged and in a storage cabinet, double packaged awaiting placement into a DOT shipping container, or already in a DOT container. The SAT did not identify any vulnerabilities associated with this facility. The WGAT reviewed the DRAFT SAT report, dated June 3, 1996, and concurs with that assessment based on the storage and packaging conditions for HEU.

Building 7001A is the isotope vault and is part of Building 7001, General Stores, located in the far east portion of the main ORNL complex. It is an open top concrete block vault with a steel door. It stores radioactive isotopes, which are not immediately delivered to operating organizations at ORNL, in their DOT shipping containers. The team did not visit the facility due to time constraints.

The design basis of the building structure is unknown and a seismic or high wind event could potentially collapse the building. While there was no HEU present in the facility at the time of the SAT assessment, the material stored in the facility will be in DOT transportation containers. The SAT did not identify any vulnerabilities associated with this facility. The WGAT reviewed the DRAFT SAT report, dated June 3, 1996, and concurs with that assessment based on the storage of HEU in DOT transportation containers.

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The entire WGAT visited Building 3508 and were escorted to the lab where the material of concern was stored by Bill Koch. This lab is in a secure area, requiring badge reader access. The lab appeared to be orderly and clean. Despite being an alpha lab earlier, the HP surveillance records indicated that it was clear of removable contamination. It contained a large glovebox, and several walk-in size vaults against one wall one of which contained the HEU. The WGAT concluded that no vulnerabilities were associated with the use or storage of sources in this facility.

4.6 Building 3525

The Irradiated Fuels Examination Laboratory (Building 3525) is used to examine radiation effects on both experimental fuels and materials through microstructure analysis and gamma spectrometry, and is also used to process Ir-92 for commercial use. The facility is located at ORNL at the corner of Central Avenue and Fourth Street. The cell structure is ventilated to the 3039 stack which is approximately 275 m south of the nearest public access. The facility was designed for the handling of high levels of radioactive materials by incorporating shielded concrete walls, shielded viewing windows, and remotely operated handling equipment. Facility features include, in addition to shielding for gamma radiation, material containment through negative pressure differentials between areas, and equipment for remote operations. The atmosphere is not inert; the cell area is maintained at the most negative pressure, with other areas outside the cell at less negative pressure. The building, except for the hot cell storing HEU, is completely protected with an automatic wet-pipe sprinkler system.

Building 3525 has fissionable material mass limits for either the hot cells or storage wells of 2 kg for process materials. These limits were established primarily for spent fuel inspection and repackaging operations.

The majority of the in-scope HEU material is presently stored outside the hot cell/storage well areas. This material outside the hot cell/storage well areas is limited to the ORNL Facility Material Control Limit of 250 g. If any of the HEU were to be moved from the 250 g limit area into the hot cell/storage well areas, NCS requirements specify that the HEU must be accounted in the total hot cell/storage well area inventories for the purpose of not exceeding the 2 kg limit noted above.

Using engineering judgment, a criticality accident in the Building 3525 hot cells or storage well areas is not considered credible based on the form, geometry, and limited quantities of the fissile material, i.e., spent reactor fuel plus minor amounts of sources and samples, with strict mass controls applied. Outside the spent nuclear fuel process area, criticality is not credible given strict adherence to the ORNL Facility Material Control Limit (250 g) for the HEU samples and sources.

In accordance with DOE Order 420.1, Section 4.3 (or DOE Order 5480.24 and its Interpretative Guidance), where a criticality accident is incredible, a criticality alarm system is not needed; and therefore, one is not present in Building 3525. The WGAT agreed with this evaluation of criticality safety. The WGAT walkdown of the facility supported the SAT finding relevant to criticality safety.

The ORNL WGAT reviewed the DRAFT SAT report, dated June 3, 1996, and was given a briefing of the facility and

The WEAF facility is normally occupied by fewer than 15 personnel from the Waste Management and Remedial Action Division. The primary mission of the facility is to provide nondestructive assay (NDA) and characterization of low level radiological contaminated solid waste contained in metal drums. The assay equipment in the building includes the Active Passive Neutron Assay Machine, real time radiography X-ray machine, and a Gamma Assay Machine. The HEU (<20 g) in this building exists in eight separate sealed sources in oxide form (1.3 g total) and in a damaged source (17 g) stored in a locked metal cabinet.

On June 7, 1996, the entire WGAT visited Building 7824 and were escorted through the building by Richard Bailey (Facility Manager) and Jim Madison. The building operations are orderly and clean with appropriate attention given to good housekeeping conditions. The sealed HEU sources are controlled inside a locked metal cabinet in the assay portion of the building near the real time radiography unit (RTR). The WGAT reviewed the ORNL DRAFT Site Assessment Team Report, dated June 3, 1996, and concur with the findings of that report that there are no vulnerabilities associated with the storage or use of HEU sources in this facility.

4.12 Building 7930

Building 7930 is a three-level structure with partial basement constructed in 1964–67 that houses a heavily shielded hot cell facility, laboratories, support areas, and offices located about one mile southeast of the main ORNL complex. Its inventory of HEU in various forms (e.g., oxides, metals, powders) totals 16 g. The WGAT reviewed the DRAFT SAT report, dated June 3, 1996, and concurs with that assessment that no vulnerabilities exist. The team did not visit the facility due to time constraints.

4.13 Building 9201-2

Building 9201-2, located at the Y-12 Plant site, is operated by the Fusion Energy Division. The building is located in the eastern part of the Y-12 Plant approximately 500 m from the nearest public access on Bear Creek Road. Building 9201-2 is a heavy noncombustible construction with reinforced concrete piers supporting a monolithic concrete floor. The concrete roof is supported on unprotected steel truss members. Exterior walls consist of concrete supporting columns with brick fill between columns. The 47 year-old building contains two major facilities: the Advanced Torodial Facility (ATF) and the Radio Frequency Test Facility (RTF). In addition, it contains several minor facilities including many laboratories, some shops, and specific experiments. The WGAT team did not visit the facility due to time constraints.

The HEU storage area consists of two locked cages and a hot cell within a locked vault on the west side of the building. The HEU sources (fission chambers) are not presently used, but are left over from ATF experiments performed several years ago. A total of 48 g of material are contained in various fission chambers and in a small source within a sealed drum. Because the material is stored in rooms in the interior of the building and HEU is in metal containers, material release to the atmosphere is unlikely. The SAT did not identify any vulnerabilities associated with this facility. The WGAT reviewed the DRAFT Site Assessment Team Report, dated June 3, 1996, and concurs with that assessment based on the storage locations and material packaging conditions for HEU.

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Building 3019 facility management have indicated to the WGAT members that additional engineered systems will be considered during the planning for the repackaging operation and the current Basis for Interim Operation (BIO) does not necessarily constitute authorization for the repackaging operation. These understandings are necessary to assure a lower consequence to the workers.

6.0 WGAT REVIEW OF THE MOLTEN SALT REACTOR EXPERIMENT (MSRE) STABILIZATION PROGRAM

The WGAT visited the MSRE on June 12, 1996, as this facility was identified as a significant vulnerability during the Spent Fuel Vulnerability Assessment. Jim Rushton briefed the team on the current conditions of the facility and plans for the stabilization. The MSRE remains a significant vulnerability due to the large quantity of U-233 stored as an unstable fuel salt within the shutdown facility systems. The stabilization program, documented in DOE/OR/01-1333&V1 R2, "Site Integrated Stabilization Management Plan (SISMP) for the Implementation of Defense Nuclear Facilities Safety Board Recommendation 94-1," is well funded, staffed, and a target for completion established. The program also has sufficient visibility to assure that progress is managed and appropriate safety oversight is provided for the hazards involved.

The purge and trap operation is approaching a readiness review. The equipment that has been designed is in place to remove the UF_6 that is on the Auxiliary Charcoal Bed and in other locations by purging and collecting this material in a new sodium fluoride trap. Any fluorine gas that has been generated by radiolysis will be collected on an aluminum trap. This reactive gas removal program is particularly important because of the mobility of UF_6 and its potential for reaction with water to form UO_2F_2, a highly radioactive vapor when the uranium is isotope U-233.

7.0 PROGRAM REVIEWS

7.1 Fire Protection Program

Responsibilities and authority for the fire protection program for ORNL are described in the DRAFT document currently being written for the site. The document is entitled "Fire Protection Program Description." Overall content of the program was reviewed, and specific issues were discussed with David Baity of the Fire Protection Engineering Department and Harold Rose, the ORNL Fire Department Chief. Primary responsibilities for fire safety, fire prevention and protection, and fire extinguishing activities are divided between various groups at the site including Fire Protection Engineering, Facility Operations personnel, Fire Department, and Maintenance/Utilities personnel.

Buildings containing HEU are fully protected by automatic sprinkler systems designed and installed in accordance with nationally recognized standards published by NFPA. Discharge of water from a sprinkler system initiates a waterflow alarm which is automatically transmitted to the central fire alarm receiving station located at the Fire Department (with secondary alarm receipt at the site LSS). Water control valves for automatic extinguishing systems are provided with electrical supervision (tamper switches) and locked in the open position to ensure water supply availability. A review of selected Fire Protection Engineering

Assessments indicates the water supply for fire protection use should be adequate and reliable. Manually activated fire alarm stations (pull boxes) are provided in each building. A full-time fire department is available for response to fire events 24 hours a day. Fire department manpower, training, equipment, and organization appear to be satisfactory.

New buildings and major modifications of existing facilities are reviewed by Fire Protection Engineering prior to start of work. Fire Protection Engineering also conducts engineering assessments of each building on a regularly scheduled basis which varies from one to five years. The specific schedule assigned each building depends on various factors such as the significance of the program mission, fire hazards, potential fire event consequence, and property value. The assessments document building size and construction, fire hazards, combustible load, personnel occupancy load and egress capability, installed fire detection and extinguishing systems, credible and maximum fire loss potential, and a description of outstanding recommendations for improving fire safety. These assessments are routed to the Fire Department for their use in routine training sessions.

Surveillance, testing, and maintenance of fire detection and extinguishing systems and equipment is conducted by Fire Department personnel and facility personnel from the Maintenance and Utility sections, as appropriate. Various inspection, surveillance, and testing activities are performed on scheduled frequencies established by the ORO Fire Prevention and Fire Protection Policy, 6th edition. The frequencies recommended by NFPA Standard 25 are not being followed at the current time per a July 1994 DOE-HQ approved equivalency

Maintenance of systems and equipment appears to be satisfactory based upon the results of the walkdown of specific facilities at the site by the WGAT team.

Monthly fire prevention inspections are performed by Fire Department personnel for each building at the site. These inspections include a review of general housekeeping, control of combustibles, control of ignition sources, and overall fire prevention. Combustible loading and ignition source control appear satisfactory based upon the results of the walkdown of specific facilities at the site by the WGAT team. Facility operations staff appear to have a good safety culture and awareness of fire safety issues. Control of hot-work activities, such as cutting and welding operations, which could serve as an ignition source are controlled by Industrial Safety Procedure IS-8.8, Revision 3, "Welding, Burning and Hotwork Fire and Health Protection." This procedure was reviewed and is appropriate for the conditions.

Pre-fire plans have been developed by the Fire Department for all significant buildings. The pre-fire plans are reviewed on a rotating three-year cycle to maintain the plan information current and up-to-date. Some of the pre-fire plans appear to be adequate. However, others are incomplete. Locations of specific fire hazards and radiological concerns should receive more prominent mention with additional detail provided in the pre-fire plans. In addition, some pre-fire plans contain inaccuracies which should be corrected. As an example, the pre-fire plan for Building 7824, dated August 1993, indicates fire detectors are installed in the building but that there is no sprinkler protection. The Fire Protection Assessment, dated March 1995, indicates the referenced fire detectors were removed and replaced with automatic sprinkler protection during a major modification of the building in 1994. When significant changes occur, pre-fire plans should be updated promptly so that the information can be used by Fire Department personnel during their routine training sessions.

7.2 Radiological Protection Program

During the WGAT evaluation of the ORNL Radiological Control Program, information was gathered primarily through facility walkthroughs, personnel, interviews, and through the review of documents including the site Radiological Protection manual and procedures, surveys, and monitoring information.

The WGAT evaluated a number of areas of the ORNL Radiological Control Program to identify the potential for inadequacies that might lead to ES&H vulnerabilities to workers for internal and external exposure. Inadequate Radiological Control Program practices could also make the public vulnerable to highly enriched uranium and lead to contamination of the environment. All elements of the Radiological Control Program fall within the purview of the Office of Radiation Protection.

Operational radiological control is fundamentally the responsibility of the worker and the Radiological Control Technician (RCT) assigned to the facility or area. Daily preparation for operational radiological control varies in its degree of formality at the facilities, but is coordinated between work supervisors and Radiation Protection supervisors and RCTs. Radiological Work Permits (RWPs) provide the principal means to evaluate and control work in radiological areas.

Worker radiological protection for HEU is aided by the fact that ORNL is on a "transuranic standard" based upon its past and current mission. This means that alpha contamination limits for HEU are considerably higher than the standard/default limits used at ORNL, i.e., as much as 10 times higher for air concentrations to 50 times higher for surface contamination.

Radiological training programs for general employees, radiation workers, and radiation protection technicians are based on DOE-approved programs. The training program for the RCTs was developed using a performance based approach.

RCTs routinely monitor the radiological condition of their facility, including general radiological monitoring, surface contamination monitoring, source control, and workplace air monitoring. General radiological monitoring is provided to characterize the radiological conditions in a facility as well as in direct support of individual jobs. Routine surveys and their frequencies, ranging from daily to quarterly or even annually, are based on the actual or potential level of contamination and the frequency of access of facility personnel and are documented in technical basis documents that are revised periodically. Workplace air monitoring involves the use of continuous air monitors for job coverage, portable air samplers, and personal air samplers, if needed. Air monitors are only one part of an overall system of radiological detection and control, which includes a bioassay program, area surveys, and contamination monitoring of personnel and equipment.

The use of respiratory protection for workers is required when areas are pı$ t d s o' b e d' t' 't th

in-scope material holdings is U-233. Since the specific activity of U-233 is more than a thousand times greater than that of U-235, it results in much greater consequences of the potential vulnerabilities. All but one of the vulnerabilities for the ORNL site pertain to this facility. The WGAT validated the four SAT vulnerabilities and identified an additional one. This WGAT-identified vulnerability applies to the planned repackaging of stored U-233 containers since the storage facility is currently inactive.

APPENDIX A

WORKING GROUP ASSESSMENT TEAM MEMBERSHIP AND BIOGRAPHICAL SKETCHES

HAROLD M. BURTON
Senior Safety Expert, SCIENTECH, Inc.

Harold Burton holds a Bachelor of Science degree in Chemical Engineering from the University of Texas (1964) and a Master of Engineering degree in Nuclear Engineering from the University of Virginia (1969).

Over his 30-year career, he has managed numerous complex technical projects in DOE programs and in the private sector, including those involving sophisticated test reactors, and the life extension and production assurance program for the largest production/power reactor. He managed the R&D, design, equipment procurement, construction, NRC licensing and EPA permitting, and startup of an HEU fuel fabrication plant for the Naval Reactors Program of DOE. This facility included a Category 1 vault and was licensed by the NRC. He managed planning of the decommissioning of a HEU commercial fuel fabrication plant; the plant was deactivated and has been cleared by the NRC for unrestricted use. He has analyzed safety of many production reactors, performed analysis of emergency systems for commercial nuclear reactors, managed the safety analysis of the LOFT reactor for intentional loss of coolant accident testing to meet 10 CFR Part 20 regulations, managed the TMI accident evaluation and examination program to improve understanding of severe core damage phenomenology, managed analysis of safety, safeguards, and security of an HEU fuel fabrication plant, and performed risk assessments of several DOE facilities. He participated in the assessment of reactor irradiated nuclear material storage across the DOE complex. Recently, he led the development of a process for assessing the safety of the storage of spent nuclear fuel and plutonium in the entire DOE complex, and was involved in the low-level waste complex-wide review assessment working group.

FRANK Y. CHEN
Nuclear Engineer, DOE/EH-34

Frank Chen received his Bachelor of Science, Master of Science, and Ph.D. degrees all in Nuclear Engineering. He is currently a nuclear engineer in the Office of Engineering Assistance and Site Interface in DOE's Office of Environment, Safety and Health. Mr. Chen has over 23 years of professional experience in the nuclear industry from engineering and design (five years in Bechtel), plant operations (received formal training for nuclear plant Senior Reactor Operators and served as part of the operation crew at Indian Point Unit 2), and engineering evaluation and analysis (10 years with Toledo Edison). He held various management positions such as senior engineer, shift technical advisor, nuclear analysis manager and simulator engineering supervisor.

Mr. Chen joined DOE in 1990 in the Office of New Production Reactors (NPR). He had responsibilities in the nuclear safety related system design including the digital plant control and protection systems.

Following the cancellation of the NPR program in 1992, he joined the Office of Nuclear Safety as a supervisory nuclear engineer. He managed the New Start and Design Review project and made significant contributions in the Operational Readiness Review (ORR) of the Replacement Tritium Facility (RTF). He also organized teams and performed the Technical Safety Reviews of the Defense Waste Processing Facility, In-Tank Processing Facility in Savannah River, the West Valley Demonstration Plant in New York, the Chemical and Metallurgical Research Lab in Los Alamos National Laboratory and the Tank Waste Remediation System (TWRS) at Hanford. Mr. Chen is a registered Professional Engineer in the state of Michigan.

JEFFREY L. KOTSCH
Senior Health Physicist, SCIENTECH, Inc.

Jeff Kotsch holds a Bachelor of Science degree in Biology from Lehigh University (1974), a Master of Science degree in Zoology and Physiology from the University of Wyoming (1977), and a Master of Science degree in Radiation Health from the Graduate School of Public Health at the University of Pittsburgh (1978). He is a Certified Health Physicist (Comprehensive) by the American Board of Health Physics (since 1986).

Mr. Kotsch has over 17 years of operational, regulatory, and oversight experience in radiological protection in both the government and commercial nuclear industry. He has been involved with worker, environment, and public safety evaluations for DOE/EH, EM, and DP; Nuclear Regulatory Commission radiological protection reviews and inspections; the Plutonium Working Group environment, safety and health vulnerability assessment for DOE /EH, and the Low-Level Waste Management Working Group vulnerability assessment for DOE/EM. He assisted DOE/EH in the design, development, and implementation of the initial Radiological Control Manual. Also, he assisted the NRC in the revision and implementation of their radiation protection standard, 10 CFR Part 20. Mr. Kotsch's previous experience includes nine years as head of a centralized radiological protection group that supported a three-unit commercial nuclear reactor complex and three years with the NRC as a licensing Project Manager.

DAVID S. MOWRER, P.E.
Principal Engineer, HSB Professional Loss Control

David Mowrer received his Bachelor of Science degree in Fire Protection Engineering from the Illinois Institute of Technology (1971). He has 25 years of fire protection engineering experience with emphasis on industrial fire prevention and protection. His current responsibilities as an engineering consultant with HSB PLC include quality assurance audits, comprehensive fire hazard analysis, computer-based fire modeling, fire detection and suppression system design and evaluation, hydraulic calculations, life safety code studies, code compliance evaluations, and project management for projects involving commercial nuclear plants and DOE-owned nuclear facilities throughout the country.

Mr. Mowrer is familiar with NFPA Standards, DOE Orders, NRC guidelines and OSHA requirements related to fire protection. He is certified as a lead auditor for nuclear power plant QA Programs (ANSI N45.2.23), is familiar with NQA-1, and serves as a fire protection consultant to the International Atomic Energy Agency. Mr. Mowrer is a registered Professional Engineer in California and a member of both the Society of Fire Protection Engineers and the National Fire Protection Association serving as a member of three technical committees.

WOODROW WILSON PITT, JR., PhD, P.E.
Adjunct Professor and Assistant Department Head, Texas A&M University

Wilson Pitt was born in Rocky Mount, North Carolina, and received his Bachelor of Science degree in Chemical Engineering from the University of South Carolina in 1957. He received his Master of Science (1966) and Ph.D. (1969) degrees in Chemical Engineering from the University of Tennessee. After a three-year stint as a commission officer in the U.S. Navy, he returned to the Chemical Technology Division at Oak Ridge National Laboratory in 1960, where he worked briefly before being called to active duty. At ORNL, he was Development Engineer in the development of various nuclear fuel reprocesses. After a year of educational leave, he returned to ORNL and was involved in the development of clinical and environmental instrumentation. As Manager of Biotechnology and Environmental Programs, and later Head of the Engineering Development Section of the Chemical Technology Division, he led R&D in environmental control technology, nuclear and hazardous waste management.

Upon retirement from ORNL in 1990, Dr. Pitt joined the faculty of the Department of Nuclear Engineering at Texas A&M University, where he teaches and conducts research in waste management and the nuclear fuel cycle. Dr. Pitt is a registered Professional Engineer in Texas and Tennessee and a Fellow of the American Institute of Chemical Engineers.

BURTON M. ROTHLEDER
Nuclear Engineer, DOE/EH-31

Burt Rothleder received his Bachelor of Science degree in Physics and Master of Science degree in Nuclear Engineering from the Massachusetts Institute of Technology. He has the principal staff responsibility for nuclear criticality safety policy and standards, and related technology, at DOE. He represents DOE in its relationships with its affiliated national laboratories and contractors. He deals with the DOE Criticality Safety Order and the Criticality Safety DOE Standard. He is involved in criticality safety technology development and information exchange. He is a member of the DOE Nuclear Criticality Experiments Steering Committee (established by the Secretary of Energy in response to a Defense Nuclear Facilities Safety Board Recommendation) and former Co-chairman of the Methodology and Experiments Subcommittee of the Steering Committee. The Committee determines which criticality experiments need to be performed (and with which priority), which criticality experiment facilities need to be maintained, and which analytic models and computer codes need to be developed to evaluate criticality safety conditions.

He coordinates the annual DOE Nuclear Criticality Technology and Safety Project (NCTSP) Conference and Workshop. For the 1995 NCTSP, he originated and organized an Embedded Topical Meeting, "Misapplications and Limitations of Monte Carlo Methods Directed Toward Criticality Safety Analysis." Most significant for criticality safety analysis was the exchange of information on Monte Carlo sampling procedures and techniques. Monte Carlo sampling poses a potential analytic vulnerability for criticality safety evaluations. He is a member of the American Nuclear Society (ANS) N-16 (Nuclear Criticality Safety) Committee, and is a member of the Executive Committee of the Nuclear Criticality Safety Division of the ANS. He is also a member of the Working Group for ANSI/ANS-8.22 (proposed), "Nuclear Criticality Safety Based on Limiting and Controlling Moderators."

Aside from criticality safety, he was a member, and Deputy Team Leader, of the DOE Plutonium Vulnerability ES&H Assessment Team. This team planned and performed site inspections and evaluated real and potential conditions that could adversely affect the environment, safety, and health of workers and the public as a result of the changing DOE mission regarding the production and deployment of plutonium.

For most of his career, his principal focus was nuclear design, in-core fuel management, and core operational analysis for pressurized water reactors (PWRs). In this regard, he was the author of several technical articles and papers. He developed the fundamental techniques used to perform intercycle fuel shuffling and to emplace burnable absorbers.

APPENDIX B

WORKING GROUP ASSESSMENT TEAM VULNERABILITY ASSESSMENT FORMS

ES&H Vulnerability Assessment Form

Vulnerability #

Site: ORNL Building/Facility: 3019 Complex WGAT #: ORNL/ B3019/WGAT/001

Block 1: *Title of the Vulnerability. (<20 words)*

Failure of U-233 Oxide Can During Handling

Block 2: *Executive Summary. (<50 words) Concise description of the sequence of events leading to the vulnerability.*

Due to potential corrosion and gas generation, a can of U-233 oxide powder could rupture during removal from its storage well. If can handling were performed using past practices, this would result in a material release, potential contamination and exposure to the workers, and dispersion of material within the facility. The facility atmosphere in the penthouse, where the storage wells are located, is vented through the RDF main ventilation system which contains three sets of roughing / HEPA filters in parallel. The discharge is through the stack and the nearest member of the public is at the site boundary, 240 meters away.

Block 3: *Describe the condition or weakness, including the material, material form, quantity (if unclassified), packaging type and number of packages, and facility and other barriers that contribute to the vulnerability.*

Vulnerability Description/Information

Material and material form	U-233 in oxide form
Material at risk (approximate mass [kg] and composition of material which may participate in the release—not necessarily the inventory of material at a given location)	4 kg of 91.4% U-233 7.7% U-234 .8% U-235 165 ppm U-232
Packaging type and number of packages	CO, BO, CO
Facility and other barriers	Only Personnel Protective Equipment are barriers to worker contamination and exposure. The facility HVAC system is a barrier to release to the environment and public.
Condition or weakness	U-233, such as stored in Building 3019 storage wells, is highly radioactive and some are in oxide form which are dispersible. The packaging is up to 31 years old.

ES&H Vulnerability Assessment Form

Vulnerability #

Site: ORNL   Building/Facility: 3019 Complex   WGAT #: ORNL/ B3019/WGAT/001

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

The potential causes of the can failure could be corrosion of the can from external moisture, presence of HF or fluorine gas as a result of radiolysis of UF_4 from other cans in the storage well, and gas buildup from radiolytic damage to plastic between the inner and outer can.

The effects of barrier (can) weakening is a release of the U-233 oxide during handling operations.

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

Personnel Protective Equipment could be employed to reduce worker exposure and contamination. Currently the cans are handled using a long handled tool with a suction device to lift the can by its uppermost lid. This handling could result in can failure if the lid to can joint were corroded.

Block 6: *Possible consequences of the vulnerability.*

A material release into the penthouse would result and cause contamination and exposure to the operators handling the can. Some of the material would be picked up in the facility ventilation system and exhausted through a roughing filter and HEPA filter before discharge through the building stack.

Block 7: *Time period in which the consequences of the vulnerability might occur (e.g., 0 to 5 years; 5 years to facility end-of-life; may not occur during facility lifetime).*

This potential vulnerability might occur in 0 to 5 years since removal from the storage wells will be a major activity as soon as equipment is readied to support a planned repackaging. Currently the repackaging is to start in 1999.

ES&H Vulnerability Assessment Form

Vulnerability #

Site: ORNL Building/Facility: 3019 Complex WGAT #: ORNL/ B3019/WGAT/001

Block 8: *Comments, views, or plans by the site operations office and site contractor relative to mitigating or minimizing any potential vulnerability. Describe the plan and schedule of corrective actions (if any).*

Planning for the scheduled inventory inspections program is continuing, including plans for repackaging material as necessary. Prior to performing this activity on material that has been in extended dormant storage, a review or assessment of operational preparations will be performed using applicable guidance from DOE on operational readiness reviews. This review will provide assurance that engineered and management controls have addressed the hazards involved and will provide appropriate protection for workers in the event of can failure during handling.

The Basis for Interim Operation (BIO) included evaluation of safety issues associated with handling a single, worst-case can of U-233. However, facility management recognizes that such evaluation does not necessarily constitute authorization to conduct handling activities on special case material that has been in long-term storage. Future updates to the BIO will determine if any additional engineered barriers for worker protection are required. This update will be incorporated (or documented through the USQD process) prior to conducting such activities.

ES&H Vulnerability Assessment Form

Vulnerability #

Site: ORNL Building/Facility: 3019 Complex WGAT #: ORNL/3019/CAT001

Block 9: *Database information*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	M (g)
U-233	powder	oxide	371.984
U-234	powder	oxide	28.077
U-232	powder	oxide	62.6 ppm

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	M (g)
Uranium Dioxide	4000.62		

Release Path Parameters[1]

Chemical Form and Release Products	[illegible]	[illegible]	[illegible]	[illegible]
oxide powder	.0001	0.01	0.20	0.00[illegible]

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minute)	ΔT (minutes)	X/Q Ex-facility	X/Q Public
Uranium Dioxide	27	1.0		.04	.0075

Appendix C

Classification of Vulnerabilities by Likelihood and Consequence

United States Government

Department of Energy

memorandum

DATE: September 24, 1996

REPLY TO
ATTN OF: Frank Chen, Working Group Assessment Team Leader, Oak Ridge National Laboratory

SUBJECT: Addendum to Highly Enriched Uranium Working Group Assessment Team Report - Vulnerability Classifications

TO: Sarbes Acharya, Project Leader, HEU Vulnerability Assessment

The Project Support Group performed initial vulnerability classifications (likelihoods and consequences) based on information contained in the vulnerability assessment forms (VAFs) completed as a part of the site assessments. During the Vulnerability Prioritization Meeting held on July 16-19, 1996 at the Washingtonian Marriott, as well as the Second Working Group Meeting, held on August 13 and 14 at the Gaithersburg Hilton, the classification results were reviewed and finalized by the Working Group and Site Assessment Team Leaders and the Project Support Group. The final results of the vulnerability classifications supersede those contained in prior versions of the Working Group Assessment Team (WGAT) report.

This memo, together with the attached final vulnerability classifications for the Oak Ridge National Laboratory, is recognized as an addendum to this WGAT report.

Frank Chen, Working Group Assessment Team Leader
Oak Ridge National Laboratory

Enclosure: Table of final vulnerability classifications

HEU Assessment VAF Summary

Site	Facility	VAF Number	Description	Volume II Reference No./Part A Sect.	Like -li- hood	Conse- quences W	P	E	VAF Cate gory
Site:	**ORNL**								
ORNL	B3019	SAT-001	Failure of storage well containers due to aging and corrosion.	8/4.1	+ H	L	*	*	MP
ORNL	B3019	SAT-002	Earthquake- and wind-caused failures of building and equipment, with releases.	8/4.1	+ VL	M	M	H	FC
ORNL	B3019	SAT-003	Leakage of Tank P-24 solutions during transfer operations.	8/4.1	+ VL	M	L	M	FC
ORNL	B3019	SAT-004	Failure to evaluate Tank P-24 for resistance to earthquakes, tornados, or missiles.	8/4.1	+ VL	L	L	L	FC
ORNL	B3019	WGAT-001	Potential corrosion, gas generation, and failure of U-233 oxide can causing worker exposure during inspection and repackaging.	8/5.1	+ H	L	*	*	MP
ORNL	MULTIPLE	SAT-001	Failure to evaluate seismic and wind resistance of facility structures.	8/4.0	-	-	-	-	IV

* Consequence Below Threshold for Characterization.
** VAF not accepted as vulnerability by WGAT.
\- IV VAFs not characterized.
\+ VAF contains U-233 or Plutonium.

APPENDIX D

REVIEWED LITERATURE AND REFERENCES

Historical and Programmatic Overview of Building 3019, ORNL/TM-12730, August 1994.

Implementation Plan and Basis of Interim Operations - Nuclear Materials Storage Vault, Building 3027, IP/3027/F/7-93/R1, August 21, 1995.

Implementation Plan and Basis of Interim Operations - Irradiated Fuels Examination Laboratory, Building 3525, IP/3525/F/7-93/R1, August 23, 1995.

Basis for Interim Operation, Waste Examination and Assay Facility, Building 7824, ORNL/WM-ARMD/7824/B10/R0, Draft.

Hazard Screening, General Stores Building 7001, Phase I Safety Analysis Report Upgrade Program, HS/7001/F/1/R0, June 1991.

Basis for Interim Operations - Radiochemical Engineering Development Center, Building 7930, B10/7930-CTD/OD-R0, August 16, 1995.

Hazard Screening - Building 9201-2, Phase I Safety Analysis Report Upgrade Program, HS/9201-2/F/1/R1, November 1992.

Hazard Screening - Isotope Enrichment Facility, Building 9204-3, HS/9204-3/F/IT-13/R0, November 24, 1992.

FSET Report on Hazard Identification and Accident Scenario Development - RADCAL Radiation Calibration Laboratory, Building 7735, HS/7735/F/1/R0, October 10, 1991.

Basis for Interim Operation - Building 3019 Complex - Radiochemical Development Facility, B10/3019/CTD/SSE/R0, in review, May 15, 1996.

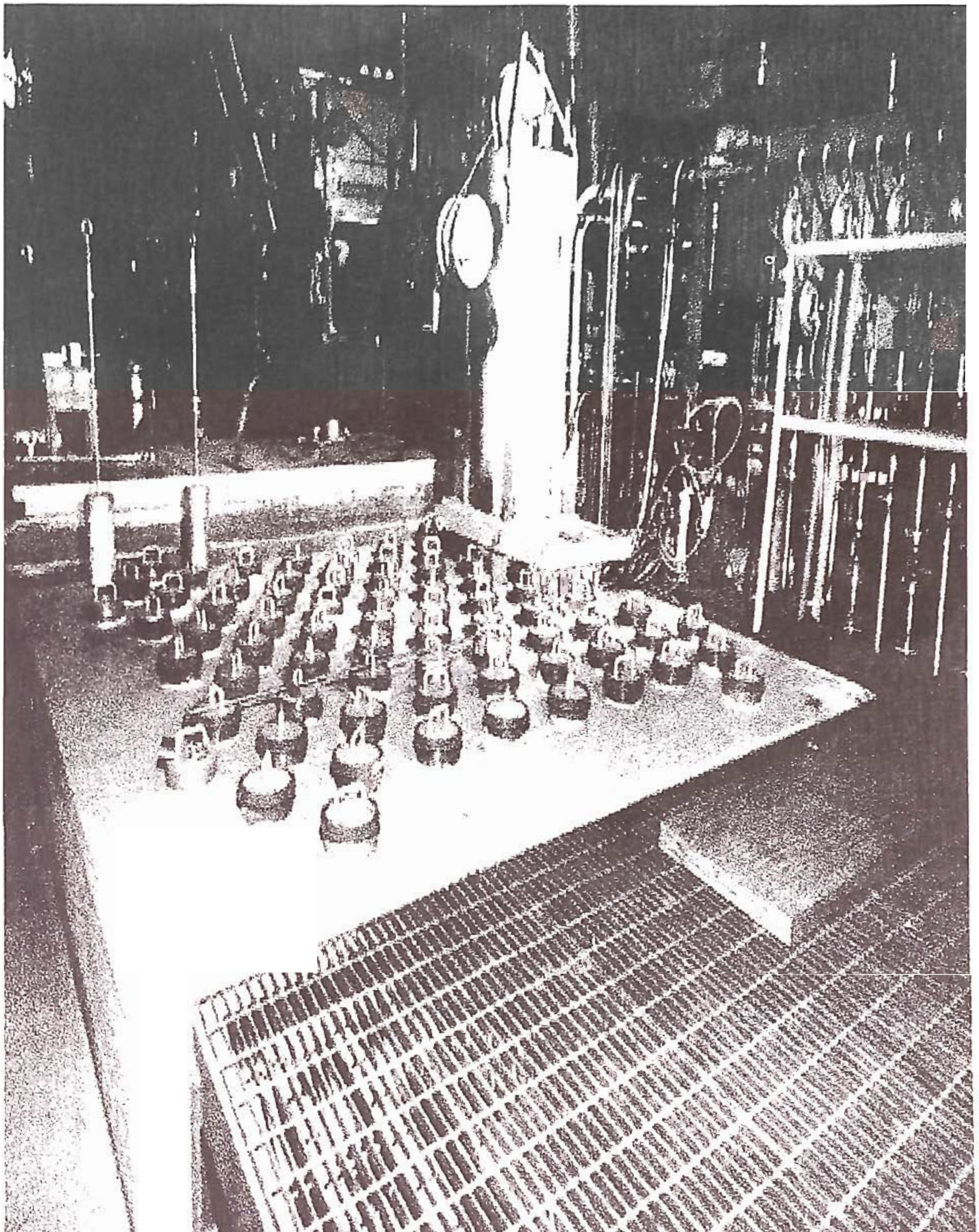
Implementation Plan and Basis of Interim Operations - Transuranium Research Laboratory, Building 5505, IP/5505/F/7-93/R1, September 1, 1995.

Hazard Screening - Building 3500, Phase I Safety Analysis Report Update Program, ORNL/M-1396/HS/3500/F/1, February 1992.

Hazard Screening - Building 3508, Phase I Safety Analysis Report Upgrade Program, ORNL/M-1397/HS/3508/F/1, February 1992.

Hazard Screening - Building 4501, Phase I Safety Analysis Report Update Program, HS/4501/F/CD-4/Rev 0, March 23, 1992.

Phase I Hazard Screening for the Oak Ridge Electron Linear Accelerator, Building 6010, HS/6010-EPM/F/1/Rev 1, April 24, 1994.



APPENDIX F

PUBLIC PARTICIPATION

The "Exit-Briefing" for the ORNL WGAT site visit was held in conjunction with the "In-Briefing" of the Y-12 WGAT site visit and the "Exit-Briefing" of the K-25 site visit on June 17, 1996. The meeting was held in the city of Oak Ridge and open to the public. Participation of the public, particularly stakeholders, was encouraged by the Department of Energy (DOE) from the outset.

No comments or questions specific to the ORNL site were expressed at the meeting.

Come join us for a public meeting on . . .

THE U.S. DEPARTMENT OF ENERGY's HIGHLY ENRICHED URANIUM VULNERABILITY ASSESSMENT

When: Monday, June 17
6:30 p.m.

Where: Pollard Auditorium, 210 Badger Ave., Oak Ridge, Tennessee

Topic: Discussion of an Oak Ridge assessment of environmental, safety and health vulnerabilities associated with highly enriched uranium (HEU) storage and operations at DOE facilities in Oak Ridge (the Y-12 Plant, the K-25 Site and Oak Ridge National Laboratory).

The assessment, which is being conducted at the direction of Secretary of Energy Hazel O'Leary according to a February 22 announcement, encompasses all forms of HEU inventory—except HEU in intact nuclear weapons, spent fuel previously evaluated, and waste.

The purpose of the study is to identify possible vulnerabilities associated with storage and handling of highly-enriched uranium and to ensure that the full range of appropriate controls are in place to prevent exposure of workers and the public to radiation or associated hazards.

A report prepared by Oak Ridge Site Assessment Teams will serve as the information base for identifying corrective actions for the safe management of HEU and will be the focus of additional evaluation and validation studies to be conducted by an independent team of experts—the Working Group Assessment Team—who will lead the discussion at the June 17 public meeting.

The assessment is being coordinated by the DOE Office of the Assistant Secretary for Environment, Safety and Health. The Working Group Assessment Team is visiting Oak Ridge facilities June 10 to July 3 to conduct review and independent verification and validation of Site Assessment Team findings. The Working Group Assessment Team will use the public meeting format to solicit public comments and questions.

A sign-in sheet will be available at the door for those wishing to make comments. Written comments or questions may be submitted by mail to Patricia Greeson, manager of Y-12 Public Affairs, P.O. Box 2009, Oak Ridge, TN 37831-8015 (or via e-mail over the World-Wide Web to pgz@ornl.gov).

A public out-briefing by the Working Group Assessment Team, in which the team will discuss the results of the assessment and answer questions, is to be scheduled for the second week in July. Time and place will be announced.

For additional information about the meeting, or if you require special accommodations to attend, call Walter Perry, DOE Community Relations manager, (423) 576-0885.

Highly-Enriched Uranium Vulnerability Assessment

PARTICIPANTS' SIGN-UP SHEET

Name **Address (optional)**

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R.J. McAlister	109 E. Malta Rd. Oak Ridge, Tn. 37830
[illegible signature]	

PART B

SITE ASSESSMENT TEAM REPORT

DEPARTMENT OF ENERGY HIGHLY ENRICHED URANIUM VULNERABILITY ASSESSMENT

OAK RIDGE NATIONAL LABORATORY SITE ASSESSMENT TEAM REPORT

JUNE 28, 1996

953139

OAK RIDGE NATIONAL LABORATORY
MANAGED BY LOCKHEED MARTIN ENERGY RESEARCH CORPORATION
FOR THE U.S. DEPARTMENT OF ENERGY

POST OFFICE BOX 2008
OAK RIDGE, TN 37831-6420

PHONE: (423) 574-5851
FAX: (423) 241-5683

INTERNET: BogardJS@ORNL.gov

October 28, 1996

Mr. Frank Chen
Department of Energy, EH-34
19901 Germantown Road
Germantown, Maryland 20874

Dear Mr. Chen:

Contract DE-AC05-96OR22464, Classification Review of Oak Ridge National Laboratory Highly Enriched Uranium Site Assessment Team Report

I have reviewed for classification the June 28, 1996, draft version of a report entitled *Department of Energy Highly Enriched Uranium Vulnerability Assessment - Oak Ridge National Laboratory Site Assessment Team Report.* The report contains no classified information. Please direct questions to me at the return address above.

Sincerely,

James S. Bogard

James S. Bogard
Authorized Derivative Classifier

JSB:ec

c: File - Rc

DEPARTMENT OF ENERGY
HIGHLY ENRICHED URANIUM VULNERABILITY ASSESSMENT
OAK RIDGE NATIONAL LABORATORY
SITE ASSESSMENT TEAM REPORT

L. T. Gordon 6-28-96

L. T. Gordon
LMERC SAT Co-Leader

D. K. Rhyne, Jr. 6/28/96

D. K. Rhyne, Jr.
DOE-ORO SAT Co-Leader

J. H. Swanks 6/28/96

J. H. Swanks
ORNL Associate Director, Operations
Environment, Safety, and Health, LMERC

Ronald O. Hultgren

R. O. Hultgren
Deputy Assistant Manager
for Energy Research and
Development, DOE-ORO

OAK RIDGE NATIONAL LABORATORY SAT REPORT

ORNL SAT Team Members

Name	Function
L. T. Gordon	Team Co-Leader
D. K. Rhyne, Jr.	Team Co-Leader
D. A. Reed	Criticality Safety
L. L. Gilpin	Criticality Safety
J. P. Snapp	Criticality Safety
J. D. Baity	Fire Protection Engineering
C. G. Palko	Maintenance
D. L. Kirby	Industrial Hygiene
B. D. Warnick	Ventilation
Dr. M. K. Singhal	Natural Phenomena
C. R. Hammond	Natural Phenomena
J. B. Hunt	Radiation Protection

TABLE OF CONTENTS

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	ing, Ventilation, and Air
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	Material Balance Are
	Molten Salt Reactor Experiment
	Nuclear Material Control and A untability
RNL	Oak Ridge National Laboratory
O	Oak Ridge Operations
u-2	Plutonium-239
	Plutonium-241
	Question Set
R&D	earch and Development
SARUP	ety Analysis Report Und gram
	nt Team
	smic alification Utility Group
	nium-2
	Uranium-2
	Vulnerability Assessment
	Working Group Assessment Team

ORNL SITE ASSESSMENT TEAM REPORT

EXECUTIVE SUMMARY

This report provides input to and results of the Department of Energy (DOE) - Oak Ridge Operations (ORO) Highly Enriched Uranium Environment, Safety and Health (ES&H) Vulnerability Assessment (VA) self-assessment performed by the Site Assessment Team (SAT) for the Oak Ridge National Laboratory (ORNL or X-10). ORNL is managed by Lockheed Martin Energy Research Corporation (LMERC) for the US DOE. As initiated by the Secretary of Energy on February 2, 1996, the objective of the VA is to identify DOE-ES&H vulnerabilities associated with HEU storage and operations to provide a foundation for decision making on the interim safe management and ultimate disposition of fissile materials.

Guidance for conducting the VA was provided in the DOE HEU ES&H VA Plan dated March 29, 1996 and supplementary guidance provided at the April 8-12, 1996 San Antonio, Texas, Team Training. The VA was performed at ORNL by a team of subject matter experts in the disciplines of natural phenomena, industrial hygiene, radiation protection, fire protection, ventilation, maintenance, and criticality safety. The team was co-led by an ORNL employee and a DOE-ORO employee. Fifteen ORNL facilities (13 at X-10 and two at Y-12) were found to contain HEU within scope of this assessment. It should be noted that these two Y-12 facilities are a part of ORNL and are separate from the HEU VA effort performed for the Y-12 plant. The team visited each of these facilities, and the team with assistance from facility staff responded to the Question Sets for each facility.

The Molten Salt Reactor Experiment (MSRE) facility contains material within the scope of this evaluation, however, it was excluded from the assessment. This facility was previously assessed during the Spent Nuclear Fuel Vulnerability Assessment. Corrective actions associated with MSRE's remediation fall within the scope of Defense Nuclear Facility Safety Board recommendation 94-1.

The SAT identified one generic vulnerability and four facility specific vulnerabilities.

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ORNL maintains a Nuclear Material Control and Accountability (NMC&A) Department. A part of this department's function is tracking HEU within the Laboratory to maintain accountability. Material balance areas (MBA) are established within ORNL facilities to delineate where material is stored, and members of the different line organizations within these facilities are appointed as MBA representatives (i.e. material custodians). Reviews by NMC&A staff ensure consistent application of appropriate control and accountability requirements. Additionally, ORNL maintains a radiation source control program. Again, its function is to ensure control and accountability of sealed sources.

Worker protection against HEU is assisted by the fact that ORNL is on a "transuranic standard" based upon its historical and current mission. In a practical sense this means that DOE alpha contamination limits for HEU are considerably higher than the standard/default limits used at the Laboratory. This varies as much as 10 times higher for air concentration to 50 times higher for surface contamination. Radiation training for general employees, radiation workers, and radiation protection technicians is based on DOE-approved programs. All employees wear dosimeters that meet the requirements of the DOE Laboratory Accreditation Program. In addition, the "Radiation Protection Program Manual" was revised in July, 1995, to reflect the necessary requirements of 10 CFR 835, "Occupational Radiation Protection." Each division that works with radioactive materials has a designated Radiation Control Officer who is the primary point of contact between the operating/research organizations and the Office of Radiation Protection.

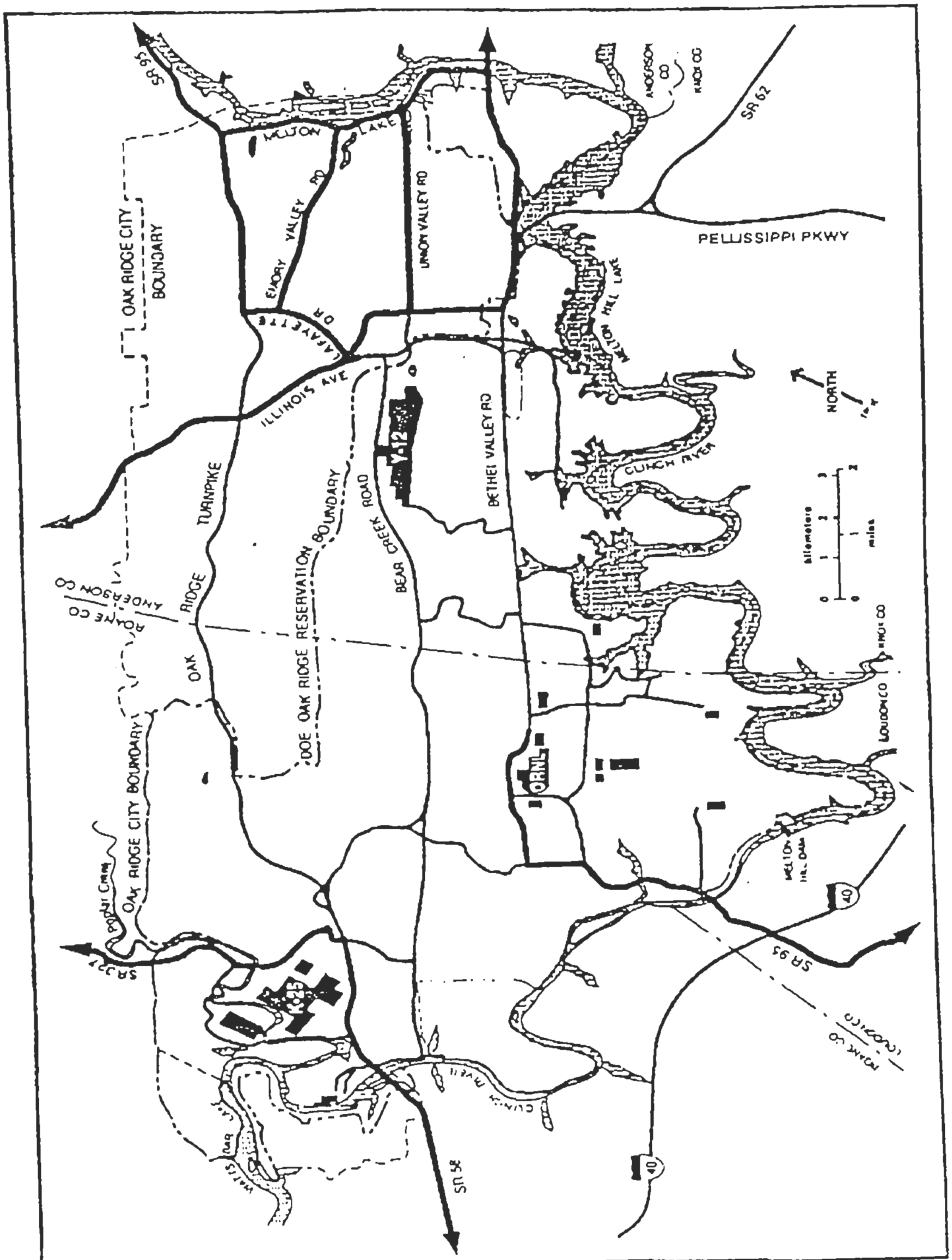
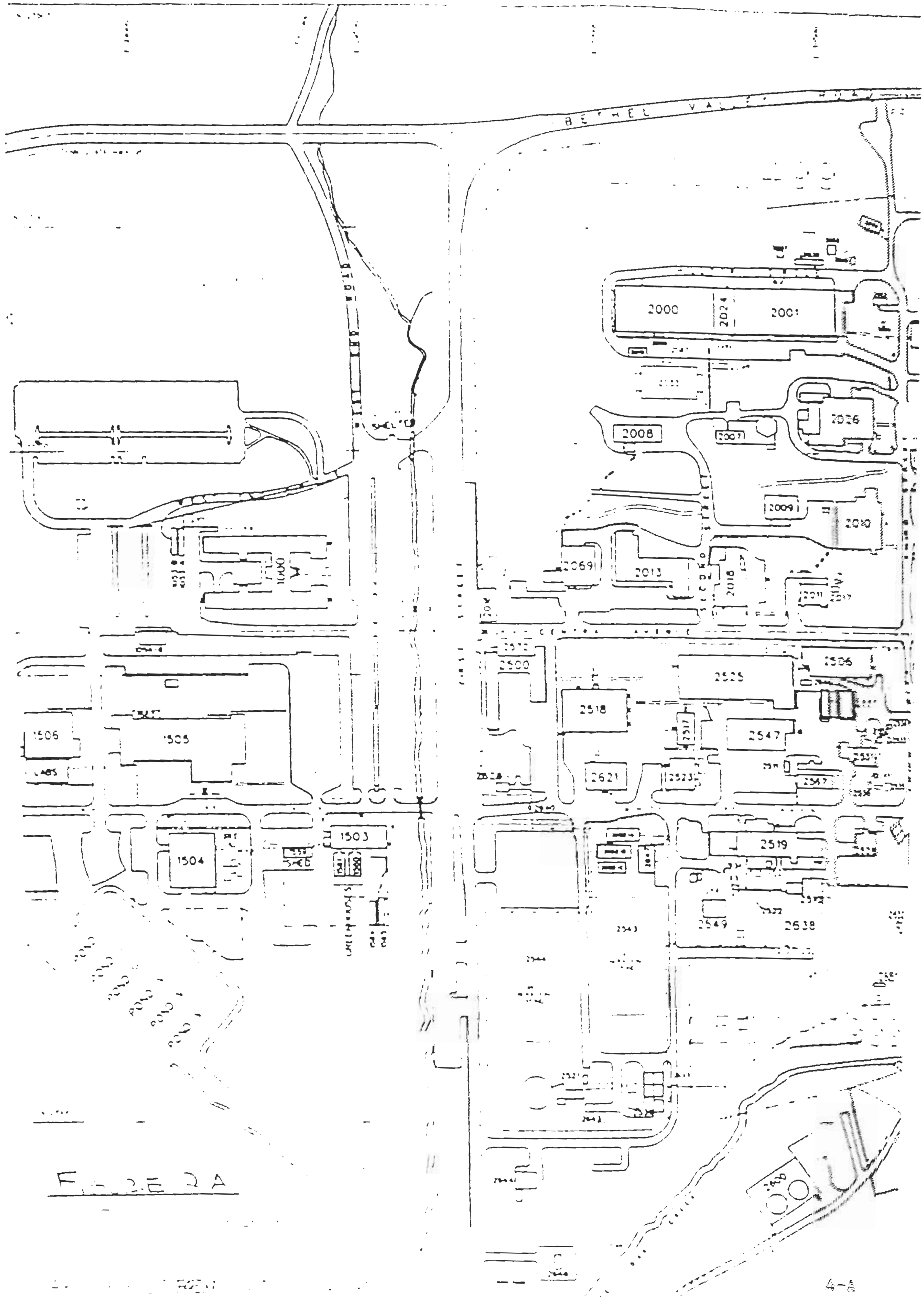


Figure 1: Oak Ridge Reservation



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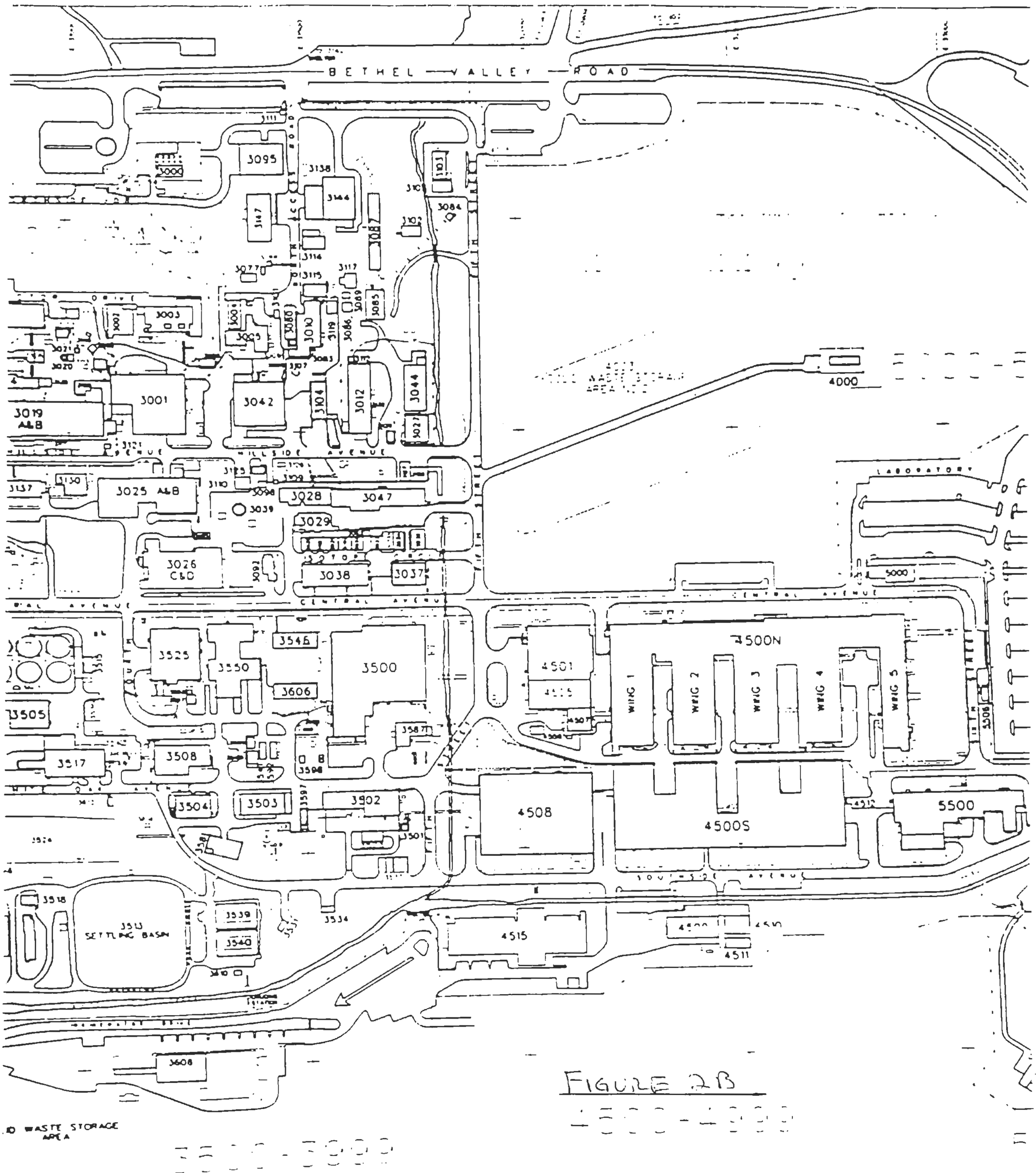
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SOUTHSIDE AVENUE
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WASTE STORAGE AREA

FIGURE 2B

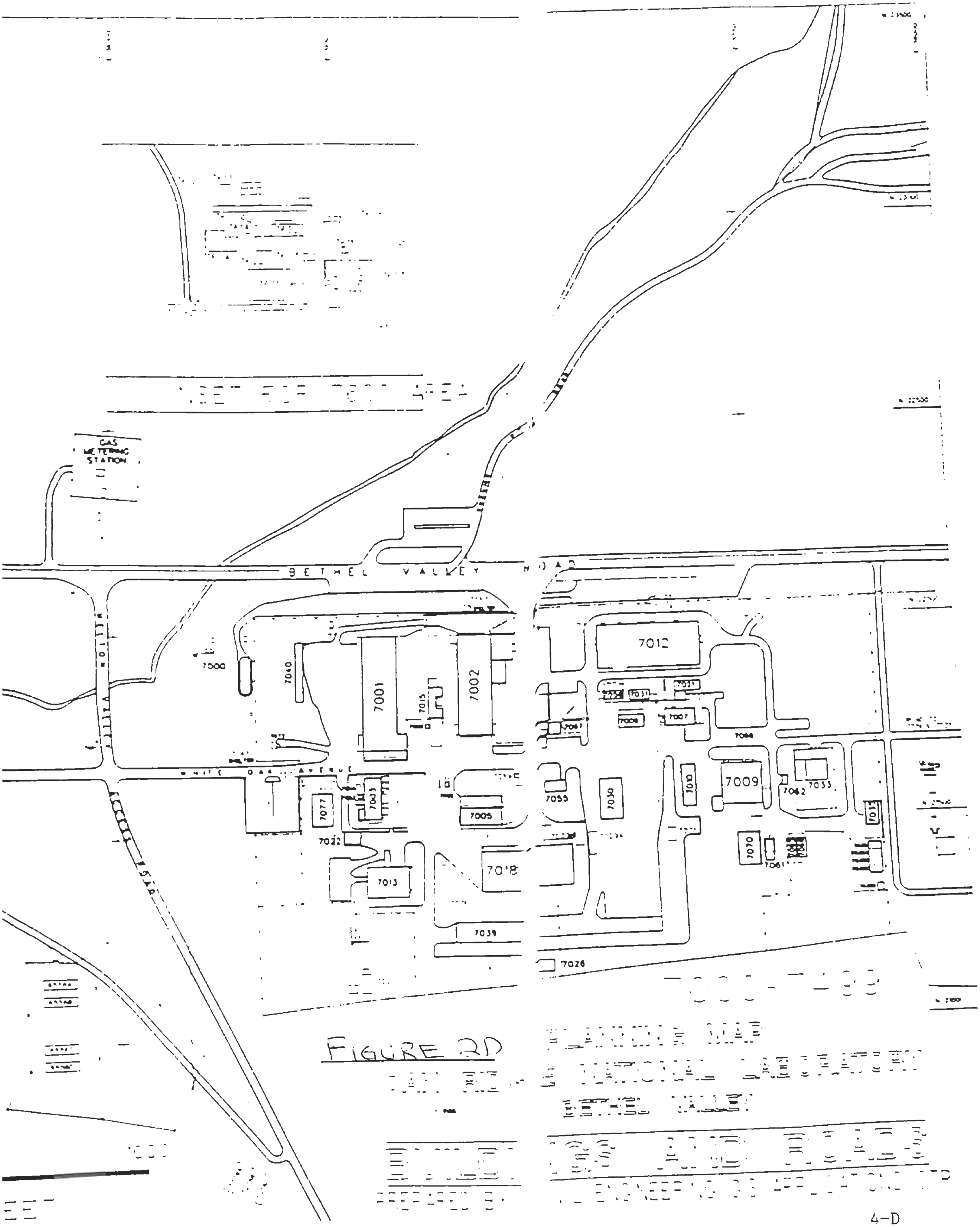
GAS METERING STATION
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FIGURE 2D
BETHEL VALLEY

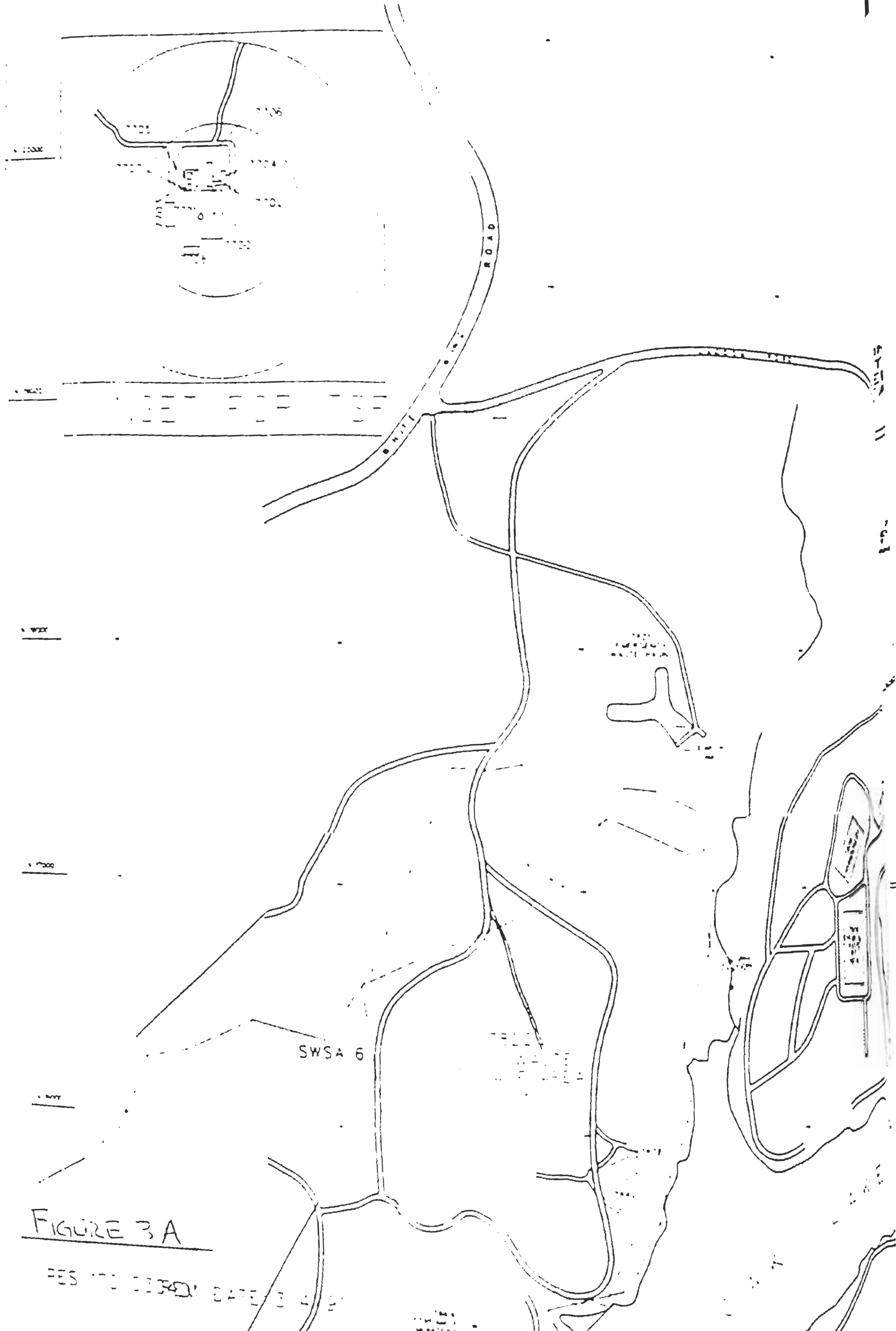

FIGURE 3 A

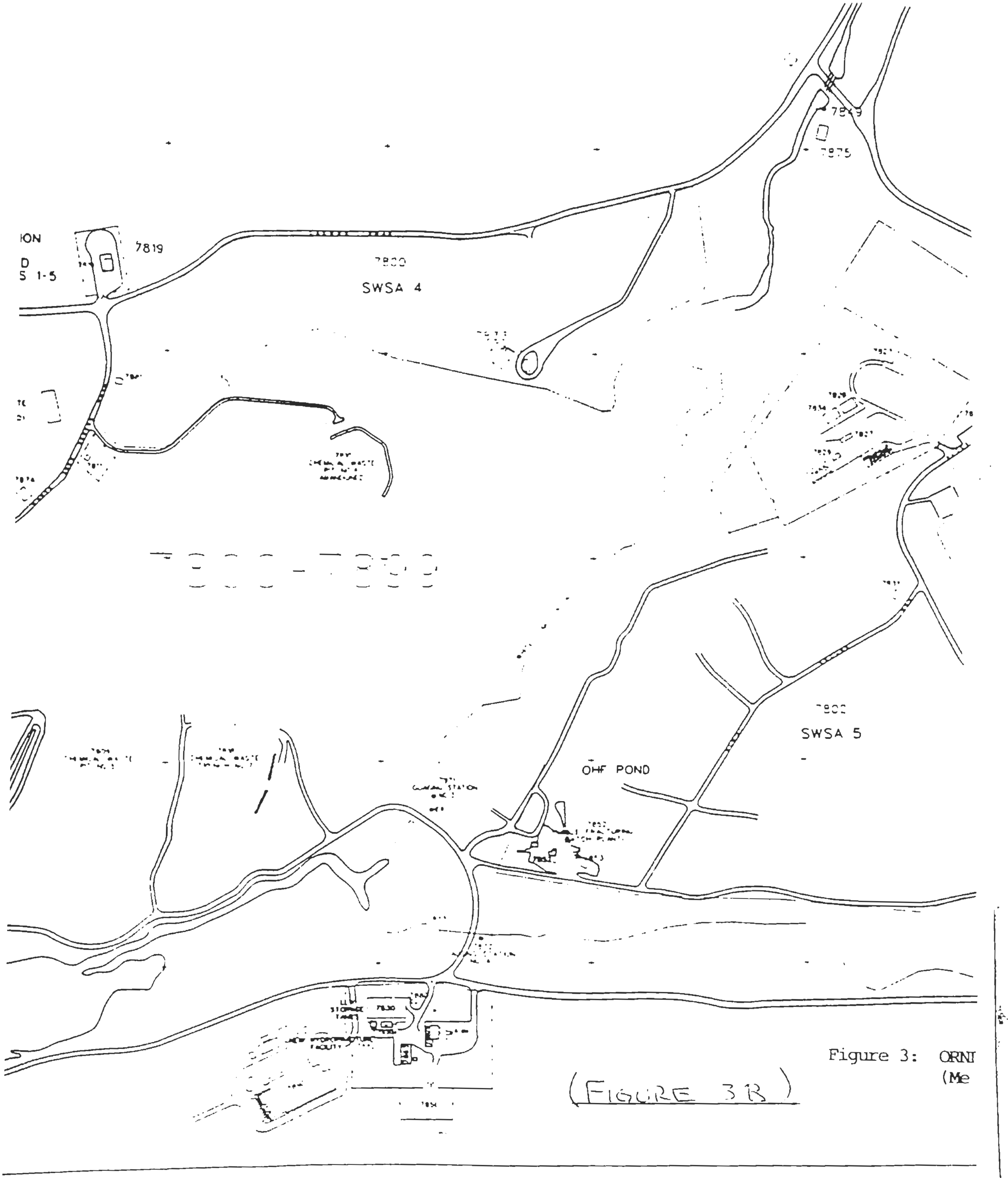

Figure 3: ORNI
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(FIGURE 3B)

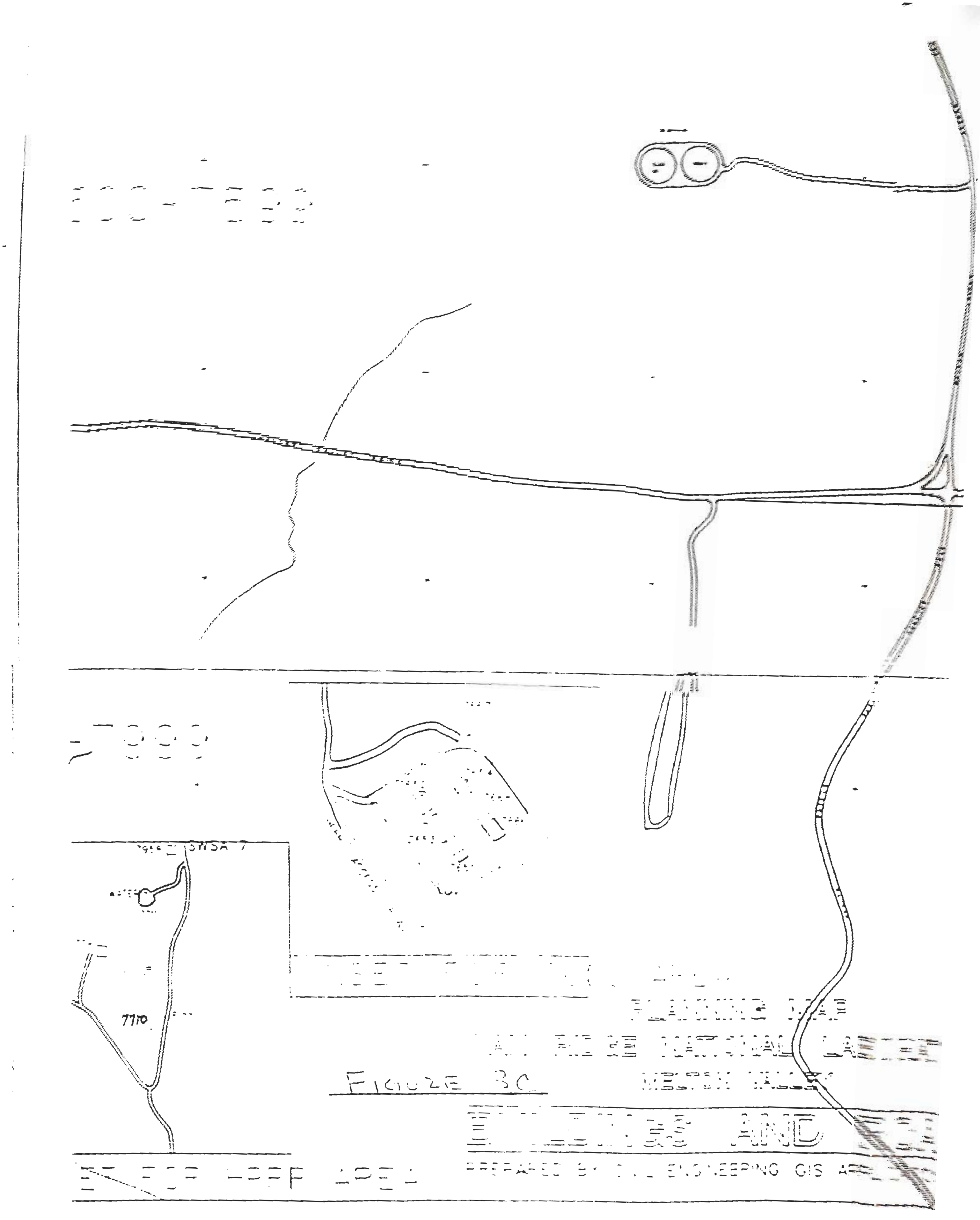

Figure 3c

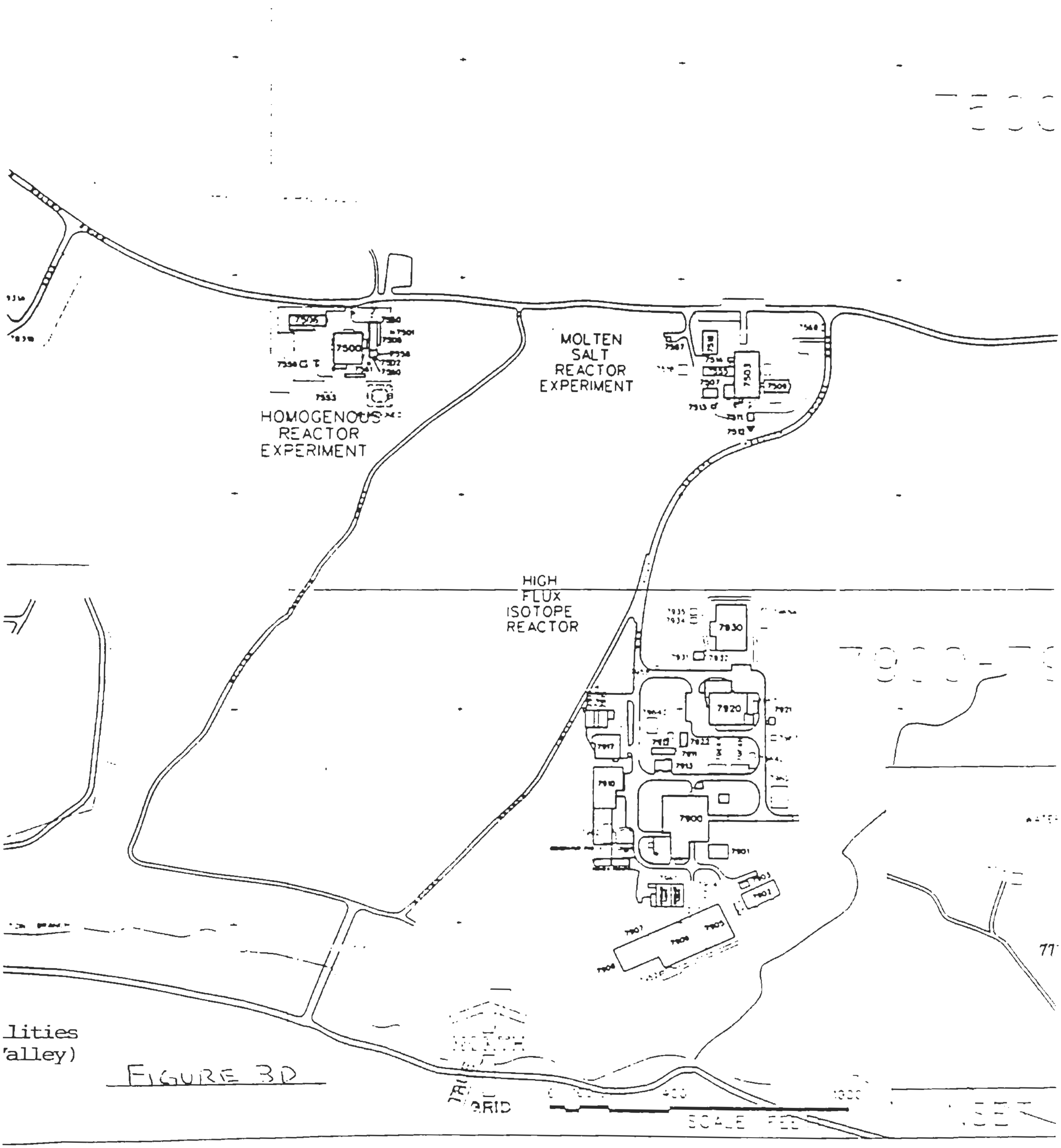

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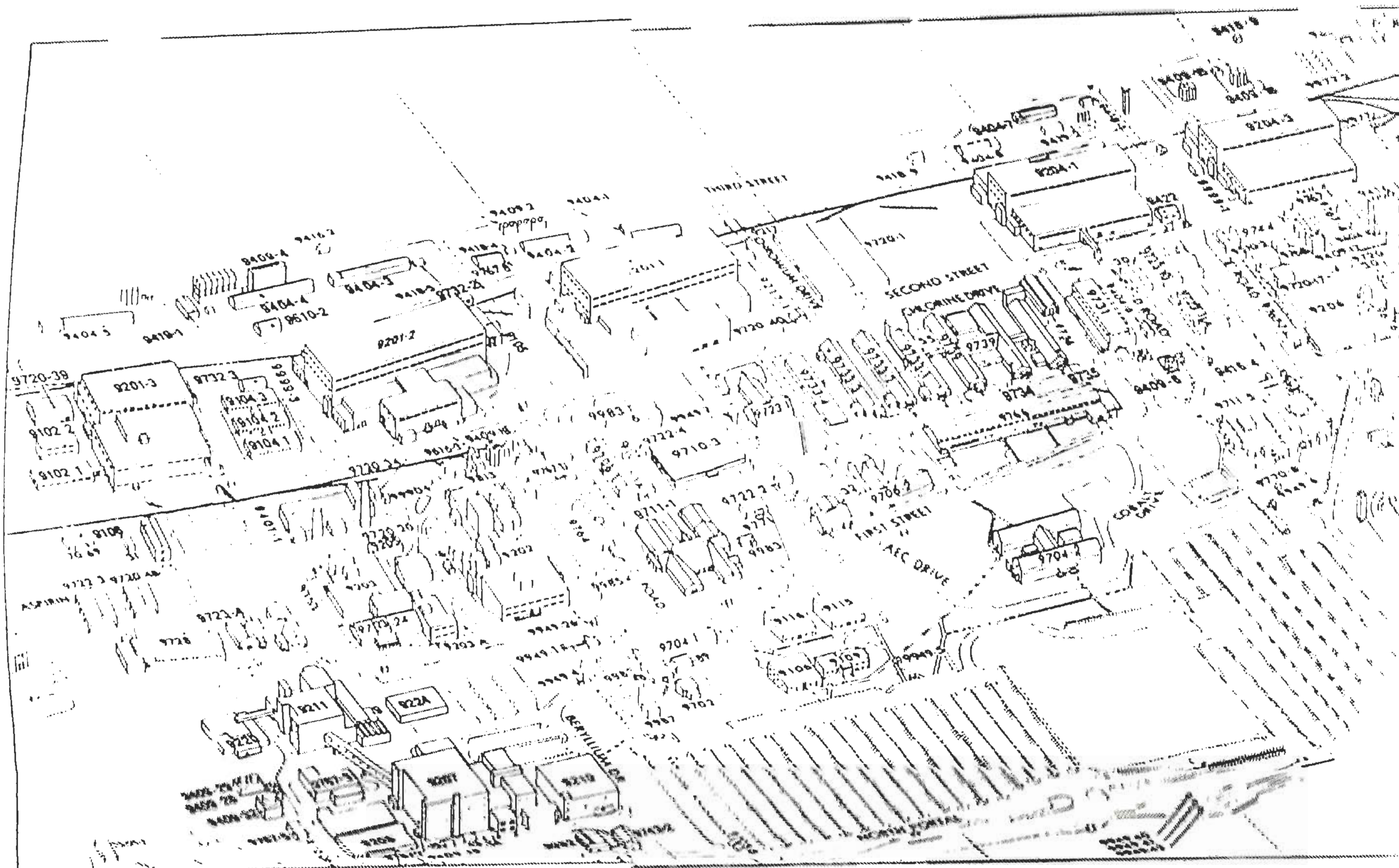
FIGURE 3D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9722-4
9711-1
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9723-A

IDENTIFICATION OF FACILITIES

Fifteen ORNL facilities (13 at X-10 and two at Y-12) were found to contain HEU within the scope of this assessment. They are identified in Table 1. It should be noted that most of these facilities are greater than 30 years old and some are greater that 50 years old, thus they may not meet present structural design requirements. Table 1 provides a summary of information about the facilities identified for the vulnerability assessment.

Table 1 : Summary of Oak Ridge National Laboratory Facility Descriptions

Building/ Facility	Mission/ Current Use	Design Features	Location	Material Form/Comp	Partitioned Areas
3019	National Repository for U-233; also store U-235.	Primary confinement; secondary confinement; storage wells; laboratories	Mid-northern area of ORNL main complex	U-233 and U-235 oxides, compounds, metals	Storage wells, laboratories and residual areas
3027	Receipt, shipment, & storage of nuclear materials	Reinforced concrete; dual-system ventilation; continuous alpha air monitor in airlock	Center of main ORNL complex	U-235 metals, oxides, sources and samples	Room 107
3036	Storage of transit materials	Brick/cement block	Center of main ORNL complex	*None	N/A
3500	Office, shops, and lab space for Istrumentation and Controls (I&C) Division researchers and engineers	Office, shops, and lab space for I&C staff	Mid-Southern area of ORNL main complex	U-235 fission chambers and powder	Room D23
3508	Office, shops and lab space for I&C staff	Negative pressure vault	Mid-Southern area of ORNL main complex	U-235 sources and fission chambers	Lab 5

Building/ Facility	Mission/ Current Use	Design Features	Location	Material Form/Comp	Partitioned Areas
3525	Examination, testing, and evaluation of materials subjected to high level radiation	Hot Cells; Confinement	Mid-South in ORNL main complex	U-233 Sources and samples; U-235 Sources, samples and reactor fuel	Hot Cells (2); Charging area wells; Second floor storage
4501	Research in separations, materials science, and sub-plot scale engineering	Hot Cells; Confinement	South-East in ORNL main complex	U-233 solutions; U-235 solutions	Hot Cell area; Room 125
5505	Advanced chemical and physical research on heavy elements including transuranics	Laboratories	South-East in ORNL main complex	U-235 metals, oxides and solutions	Lab 31; Room 45A
6010	Pulsed, intense neutron source for basic and applied physics research	Shielding walls	East of ORNL main complex	U-235 metal foils	Basement
7001A	Storage of transit materials	Shielding walls	Far east of ORNL main complex	*None	Storage Vault
7710	Research in measurement of rad fields and contam.	Storage, labs, and supporting facilities	South of ORNL main complex	U-235 fission chambers	Room C208

Building/ Facility	Mission/ Current Use	Design Features	Location	Materia Form/C...	Partitioned Area
7824	Nondestructive assay and examination of solid radioactive waste contained in drums and boxes	Steel framed structure, aluminum siding, concrete floor	SWSA 5 in Melton Valley; South of ORNL main complex	U-235 sources; metal fo...	Storage area
7930	Development and demonstration of remote processing of irradiated thorium-based fuel; fabrication of recycled material	Glove boxes; Hot Cells; Laboratories	Melton Valley; South of main ORNL complex	U-235 on wires	Hot Cell; Counting laboratory
9201-2	Fusion energy research	Brick/cement block	Y-12 Plant	U-235 fission chambers	Storage Area
9204-3	Calutron enrichment of U-235; Electromagnetic separation of stable isotopes	Mechanically operated shielding; interlocks on furnace shielding doors; locator systems	Y-12 Plant	U-233 oxide, solution; U-235 metal, oxide, compounds	Laboratory; Vault; Conversion lab

* - These facilities are staging areas for radiological material shipments into and out of the laboratory. At the time of the SAT's visit to these facilities, they contained no HEU.

DISCUSSION BY FACILITY

Walkdowns of the in-scope facilities by the SAT led to the identification of four concerns and responses to the Question Sets led to the identification of four HEU vulnerabilities. Responses to the Question Sets for each facility can be found in Appendix B, and a summary of the vulnerabilities can be found in Table 2.

A generic vulnerability, which applies to all 15 facilities within scope of this assessment, was identified due to natural phenomena analyses not meeting today's requirements. Thus, a seismic event could result in the destruction of facilities and enclosures and further result in rupture of packaged materials, while high winds could result in the transport of material offsite. Four facility specific vulnerabilities were identified at building 3019. Vulnerability Assessment Forms can be found in Appendix C. A summary of each facility is provided below.

Building 3019

The material in this facility is contained in storage wells, laboratories, and residual areas. Two concerns and four vulnerabilities were identified.

Building 3027

The material in this facility is contained in one storage room. One concern and no vulnerabilities were identified.

Building 3036

Material in this facility is contained in one area. No vulnerabilities were identified.

Building 3500

Material in this facility is contained in one room. One concern and no vulnerabilities were identified.

Building 3508

Material in this facility is contained in one room. No vulnerabilities were identified.

Building 3525

Material in this facility is contained in two different hot cells, in charging area wells, and in storage on the second floor. No vulnerabilities were identified.

Building 4501

Material in this facility is contained in a hot cell area and in a storage room. No vulnerabilities were identified.

Building 5505

Material in this facility is contained in a laboratory and a storage room. No vulnerabilities were identified.

Building 6010

Material in this facility is contained in one storage area. No vulnerabilities were identified.

Building 7001A

Material in this facility is contained in one storage area. No vulnerabilities were identified.

Building 7710

Material in this facility is contained in one room. No vulnerabilities were identified.

Building 7824

Material in this facility is contained in one storage area. No vulnerabilities were identified.

Building 7930

Material in this facility is contained in a hot cell and a counting laboratory. No vulnerabilities were identified.

Building 9201-2

Material in this facility is contained in one storage area. No vulnerabilities were identified.

Building 9204-3

Material in this facility is contained in a laboratory, vault ar: conversion laboratory. No vulnerabilities were identified.

Table 2. HEU Vulnerabilities Identified at ORNL

No.	Facility	Vulnerability	Scenario
1.	Generic	Material Release	Existing natural phenomena analyses do not meet present requirements, thus material release could result.
2.	3019	Material Release	Material release from storage wells due to aging/corrosion of packaging, or radiolysis.
3.	3019	Material Release	Material release from laboratory areas due to natural phenomena.
4.	3019	Material Release	Material release from tank P-24 due to equipment failure during material pumpout.
5.	3019	Material Release	Material release from tank P-24 due to natural phenomena.

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APPENDIX A

SITE ASSESSMENT TEAM MEMBERSHIP AND BIOGRAPHICAL SKETCHES

Co-Team Leader: L. Tommy Gordon

Mr. Gordon is a Mechanical Engineer with over 25 years experience in program management, engineering design, and configuration management. He is presently serving as the ORNL Configuration Management Program Manager. His professional experience prior to this assignment involved configuration management, operations, maintenance, construction and design activities with the Tennessee Valley Authority nuclear program. He has been at ORNL for six years.

Co-Team Leader: D. Ken Rhyne, Jr.

Mr. Rhyne is a Nuclear Engineer with a background in systems engineering and safety analysis. He is presently serving as a program manager for DOE-ORO's Oak Ridge National Laboratory Site Office. His duties in this capacity include oversight of ORNL's programs in the areas of facility safety documentation upgrades, criticality safety, fire protection, nuclear materials control and accountability, quality assurance, configuration management, and Unreviewed Safety Question Determinations. Prior to this assignment, his other DOE-ORO assignments were with the Safety and Health Division performing safety documentation reviews, and the High Flux Isotope Reactor Site Office providing a liaison between DOE and the operating contractor. His professional experience prior to DOE involved systems engineering with the Tennessee Valley Authority at both the Sequoyah and Watts Barr Nuclear Plants.

Criticality Safety: Davis A. Reed

Mr. Reed is presently a Nuclear Criticality Safety Engineer for the Oak Ridge National Laboratory. Prior to this assignment, he served as a Nuclear Criticality Safety Engineer for the Oak Ridge Y-12 Plant. His primary area of experience is general criticality safety engineering support to maintain safe storage and chemical processing of U-233, U-235 (high and low enrichment forms), Pu-239/241, and transplutonium isotopes, and safe storage and handling of highly enriched irradiated and unirradiated nuclear fuel. He holds a membership in the ANS-8 Standards Subcommittee for Fissionable Materials Outside Reactors, and is Chairman of the Standards Group ANSI/ANS-8.3, Criticality Accident Alarm System.

Criticality Safety: Linda L. Gilpin

Ms. Gilpin is presently a Nuclear Criticality Safety Engineer for the Oak Ridge National Laboratory. Prior to this assignment, she served as a Nuclear Criticality Safety Engineer for the Oak Ridge Y-12 Plant. Her primary area of experience is general criticality safety engineering support to maintain safe storage and chemical processing of U-233, U-235 (high and low enrichment forms), Pu-239/241,and transplutonium isotopes, and safe storage and handling of highly enriched irradiated and unirradiated nuclear fuel. She performed fuel pin design for the Fast Flux Test Facility as an engineer for the Westinghouse Hanford Company Advanced Reactor Development Division.

Criticality Safety: Johnathan P. Snapp

Mr. Snapp has been employed at ORNL since 1993 as an Applied Health Physicist (1993-1994) and later as a Nuclear Criticality Safety Engineer (1995-present) within the Office of Operational Readiness and Facility Safety. He has a B.S. in Physics and an M.S. in Nuclear Engineering.

Fire Protection: J. David Baity

Mr. Baity has been employed at ORNL since 1983 as a Fire Protection Engineer. He is presently the Senior Fire Protection Engineer at ORNL in the Office of Laboratory Protection. Mr. Baity has over 20 years of experience in the fire protection arena including fire department operations and fire protection engineering. He holds a B.S. in Fire Protection and Safety Engineering Technology from Oklahoma State University and A.A.S. degrees in Fire Protection Engineering Technology and in Industrial Health and Safety Technology. He is presently certified as a Certified Safety Professional.

Maintenance: C. Greg Palko

Mr. Palko is manager of Area One Research and Facility Services for the Plant and Equipment Division (ORNL's maintenance organization). He has seventeen years of engineering experience, including five years on the gas centrifuge program, two with production machining at Y-12, and five with the Plant and Equipment Division. He received his B.S. in Engineering Science and Mechanics from Tennessee Tech in 1979 and his M.S. in Engineering Management from the University of Tennessee in 1990. He is currently working on his dissertation in preparation for his PhD. in Engineering Management from the University of Alabama in Huntsville. Mr. Palko was a member of the Laboratory's Radioactive Operations Committee for eight years.

Industrial Hygiene: David L. Kirby

Mr. Kirby has been employed at ORNL since 1989 as an Industrial Hygienist. He presently is the Industrial Hygiene Program Manager at ORNL in the Office of Safety and Health Protection. Mr. Kirby has over 20 years experience in the ES&H field. He received an M.S. in Environmental Health from East Tennessee State University and presently is certified as a Certified Industrial Hygienist and a Certified Safety Professional.

Ventilation: Bruce D. Warnick

Mr. Warnick presently serves as Section Supervisor of the Facility Mechanical Systems section of the Central Engineering organization. His specialty is HVAC and Nuclear Confinement Systems. Prior to this assignment, he worked in the Tennessee Valley Authority Nuclear Engineering Program. Mr. Warnick is a registered professional engineer in the state of Tennessee.

Natural Phenomena: Dr. Mahender K. Singhal

Dr. Singhal is a registered professional engineer with over 23 years of experience in safety analysis of nuclear facilities, and project and program management. He holds a Ph.D. In Aerospace Structures. He has an extensive working knowledge of DOE-STD-1020 (formerly UCRL-15910), DOE order 6430.1A and other DOE documents on mitigation of Natural Phenomena Hazards. Work assignments have included the evaluation of several buildings, structures, equipment and piping systems (utilizing DOE/SQUG approach and computer analysis) for the Natural Phenomena Hazard loadings for Oak Ridge, Paducah and Portsmouth Department of Energy sites. He has contributed to the preparation of Safety Analysis Reports for DOE facilities to meet the requirements of DOE Order 5480.23. Additionally, he has developed software to calculate Natural Phenomena Hazard loads, to process the output results from various computer codes to improve accuracy, and to promote efficiency and reduce the time required to perform evaluation of DOE facilities. Dr. Singhal has authored several technical papers and reports.

Natural Phenomena: C. Richard Hammond

Mr. Hammond has served as group leader for the evaluation of piping and equipment for resistance to natural phenomena hazards at Gaseous Diffusion Plants. Additionally, he has served as group leader for seismic or wind/seismic resistance analysis of the High Flux Isotope Reactor building, primary cooling system, components, and exhaust stack; the Radiochemical Engineering Development Center building and components; the Liquid Low Level Waste system; and various isotope storage and handling facility buildings, glove boxes, and components. Additionally, he has performed confirmatory analyses on selected piping systems at three commercial nuclear power plants for the Nuclear Regulatory Commission. He has been certified in UCRL-15910 training, DOE-SQUG training, and DOE Seismic Evaluation of Piping Systems Using Screening Criteria. He is a member of the Subgroup on Structural Design - Code on Nuclear Air and Gas Treatment (ASME AG-1).

Radiation Protection: Jerry B. Hunt

Mr. Hunt is presently the head of the Radiological Surveillance Section in the ORNL Office of Radiation Protection. He has 25 years of experience in health physics at the OR Reservation. Prior to coming to ORNL in 1994, he served in the Health Physics Department at the K-25 Site and as the superintendent of the Y-12 Plant's Health Physics Department. He was registered by the National Registry of Radiation Protection Technologists in 1978 and certified by the American Board of Health Physics in 1984.

APPENDIX B

RESPONSES TO QUESTION SET BY FACILITY

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 3019
	FUNCTION:	URANIUM-233 STORAGE

Question 1: SITE

DOE Headquarters Facility Landlord: Defense Programs

Headquarters Program Sponsor: Defense Programs

Design Life: 81

Facility Age: 53

Location of Facility on Site and Distance to Site Boundary

The Radiochemical Development Facility (RDF, Building 3019 Complex) is located in the mid-northern area of Oak Ridge National Laboratory's (ORNL) main boundary. See Figure 1 for the location of ORNL and the RDF within ORNL. The site boundary has been identified to be at Bethel Valley Road, approximately 240 meters due north of the RDF.

Design Mission, Interim Mission, Current Use

The RDF is a Manhattan Project vintage facility originally built to perform the first plutonium separations from irradiated reactor fuel and to demonstrate other nuclear fuel processes on a pilot scale.

The current mission of the RDF is to serve as the National Repository for U-233. To accomplish this mission, the RDF must maintain as a minimum the following capabilities:

1. Physically handle multi kilogram quantities of U-233
2. Process multi-kilogram quantities of U-233 and Enriched Uranium in gloveboxes and/or storage cells

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building
	FUNCTION:

Question 1: SITE

Operational Status

Historical Information

1. SIGNIFICANT ABNORMAL OCCURRENCES AND/OR ACCIDENTS

1.1 In November 1959, there was a chemical explosion in Cell No. 6 of Building 3019. The explos... decontaminated using nitric acid and other materials. No one was injured in the explosion, howe... and outside the facility. Alpha activity was spread from Building 3019 southward and covered a... Hillside Road between Third and Fifth Streets. There was no release off-site and no long term hea...

Corrective actions included decontamination of the building and surrounding areas and seali... roadways and re-roofing several buildings. Operations were reviewed and a secondary containm...

1.2 In August 1979 there was a release of U-233 associated with liquid level instrumentation wh... personnel exposure. There was localized contamination on associated nearby equipment inside the facility.

Corrective actions included decontamination of the facility and modifying procedures to incl...

1.3 In September 1983 a waste solution containing Rn-220 was being transferred from tanks P-6... the Liquid Low-Level Waste (LLLW) System. This was a normal transfer from the facility's tank... transfer, an evolution of Rn-220 and its alpha decay daughters into the ventilation system occurr... in room 30...

Corrective actions included decontamination, removing the sink to which the drain was connected, and...

2. SIGNIFICANT SAFETY RELATED FINDINGS

2.1 An OSR violation occurred in 1991 when the fixed fire protection system was not inspected within the required... grace period. Corrective actions included evaluating staffing and funding requirements; evaluating the need for OSR... notifying ORNL support organization of need to reevaluate inspection, testing, and maintenance requirements... fire protection requirements in their OSRs; informing ORNL management of need to provide adequate fire protection... order compliance; and emphasizing to ORNL management the need to complete the DOE Tiger Team ...

All of these corrective actions were completed during 1992.

2.2 An OSR violation occurred in 1991 when monthly operation of the spare ventilation fans required by the OSR wa... The documented surveillance was performed 2 days after being required. Corrective actions included creating a ... surveillance checksheet which highlighted monthly checks that are required by the OSR; training personnel on the... the associated procedure; and reviewing other facility checksheets for similar problems.

All corrective actions were completed by 1992.

2.3 A criticality infraction occurred in 1992 when a review of storage well loading data, initiated by facility manage... compliance with the loading limits could not be adequately verified and may have been exceeded in segments of the... ...tions included preparing and obtaining approval of an updated NCSA for storage wells; preparing a procedure fo... ...M in storage wells, requesting funding to pursue an appropriate Configuration Management program; reviewing... operations elements related to the occurrence, and completing a quantitative evaluation to ensure that the present... configuration has an adequate margin for criticality safety.

All of these corrective actions were completed during 1993.

In 1992 the Facility Radiation and Contamination Alarm System (FRACAS) activated because of a blown fuse. The facility was not operational and no personnel were present; therefore, no evacuation of personnel was necessary. It was determined that additions to the system over the years had overloaded the system. It was also discovered that due to wiring diagram errors, an alarm group was not wired to the facility's evacuation horn. This system did, however, alarm locally and at two other locations within ORNL that were manned 24-hours a day. Corrective actions for these conditions included reviewing and making necessary corrections to the configuration control procedures for safety related equipment; modification of FRACAS system testing procedures to ensure operational aspects of the system are thoroughly tested following modifications; and review and upgrade of the FRACAS system design as required.

All corrective actions were completed by 1994.

2.5 In 1993, during a facility review initiated by the facility manager, it was discovered that a sample gallery High Efficiency Particulate Air (HEPA) filter had not been tested semiannually, as required by the facility OSR. The missed surveillance was bracketed by two inspections (one six months earlier and one six months later than the scheduled surveillance). During a review of this event it was determined that the supporting organization responsible for performing the surveillance had inadvertently listed the frequency as annual rather than semiannual. In addition, facility check procedures failed to detect the missed surveillance. Corrective actions included revising the facility check procedure to establish a more effective method for tracking and ensuring compliance with surveillances; issuance of a Memorandum of Understanding (MOU) with the support organization regarding testing of OSR items and specifically identifying the items to be tested; confirming that all OSR surveillances are properly identified for all support organizations performing testing; and distribution of "lessons learned" from this occurrence to other ORNL facility managers.

All corrective actions were completed by 1994.

In 1995, during a walkthrough of the facility by a representative of the DOE Nuclear Safety organization, concerns were raised at cracks in the floor of the penthouse. The floor of the penthouse area in the RDF is approximately 4 feet thick and serves as shielding for several storage wells (inter-cell wells) which penetrate the penthouse floor and reside in the walls between hot cells located directly beneath the penthouse. The cracks had been previously identified by facility management and were being monitored to ensure adequate performance of shielding in the location of the cracks. It was speculated during the walkthrough that the cracks may have spread through the flooring and into the hot cell walls below. Concerns raised at this time were related to the performance of the cracked area during a seismic event and the effect of potentially introducing water into a seismically induced enlargement of the crack. To evaluate these concerns, an Unreviewed Safety Question Determination (USQD) was initiated along with reviews to determine the extent and possible effects of the "cracks." During this review it was concluded that the cracks only existed in the 4-inch concrete topping which was poured over the hot cells which are present on the floor below. The cracks were determined to be centered directly over the centerline of the 5-foot thick concrete walls which partition the hot cells. Visual examination of the hot cell walls, along with reviews of design drawings, revealed a construction joint located 2 feet 6 inches from the edge of the 5-foot wide walls (i.e., in the center of the wall). This construction joint was formed as each cell wall was poured in place. It was concluded from the review that the cracks in the 4-inch topping poured on top of the hot cells resulted when the construction joints "telegraphed" through the topping. This was noted as a common occurrence which was not an indication of any structural problem.

Evaluation of the seismic behavior of the system has shown the cracks have no effect on the seismic resistance of the storage facility. A criticality evaluation with water entering the cracks shows no difference in the conclusions regarding the criticality safety of the storage array. A meeting was conducted with Nuclear Safety personnel who raised the concerns to review the evaluations to ensure all concerns were addressed. The completed evaluation addressed all the concerns of the Nuclear Safety personnel. A final USQD, documenting the results of the evaluations, was completed and approved. The USQD concluded that there was no unreviewed safety question (USQ).

To prevent reoccurrence, USQD awareness training was given on March 15, 1995, to all Radiochemical Technology Section sonnel; the training highlighted the requirements for USQD preparation. This action was taken to help ensure any future "as-found" nditions are evaluated through the USQD process in a timely manner in accordance with DOE 5480.21.

A listing of non-significant occurrences is located in the Occurrence Reporting and Processing System (ORPS) database.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	FUNCTION: URANIUM-233 STO[illegible]

Question 1: SITE

;AFETY RELATED CHANGES

The facility has been modified many times over the period of its existence. During its almost-50-year history, the RDF has bee[illegible] for development and operation of several well-known methods for nuclear fuel processing (PUREX, THOREX, FLUORIDE VO[illegible] etc.). The equipment utilized to process multi-kg amounts of nuclear material in gloveboxes and in the shielded hot cells has b[illegible] flushed (partially decontaminated) and placed in safe standby.

Since 1963, the RDF has been designated as the National Repository for U-233. The Repository is equipped with fully safeg[illegible] storage wells where multi-kg amounts of solid fissionable material are stored.

List Authorization Basis

There are two major components to the RDF authorization basis -- a BIO and an OSR which reflect, most accurately, curre[illegible]

1) Chemical Technology Division, "Basis for Interim Operation (BIO) Building 3019 Complex - Radiochemical Develop[illegible] (RDF)" BIO/3019-CTD/SSF/R0, approved by DOE June 1996

2) Chemical Technology Division, "Operational Safety Requirements (OSR) for the Radiochemical Development Fac[illegible]" OSR/3019-CTD/R1, issued for DOE approval 1996.

The currently approved BIO and OSR are encumbered with the trappings of documents undergoing transition from a 19[illegible] SAR/OSR set to a 1990's version. Although we are abiding by the provisions therein, the collection of documents referen[illegible] [illegible]ved transition BIO and OSR represents a very complex description of the facility encumbered by internal processes [illegible] [illegible]ger in active use nor planned to be used in the future. The aforementioned BIO and OSR provide the assessment tea[illegible] clearer and more useful description of the current facility and the activities conducted therein.

ribe Important or Unique Design Features

ımary Confinement Areas

Primary confinement areas include the gloveboxes, hoods, vessels, and the cells within the RDF. The Cell 4 wells and Intercell Storage wells are not used for primary confinement; however, their design will support primary confinement, if necessary.

2. Secondary Confinement Boundary

The physical boundary represented by the edge of the shaded areas in Figures 2-4 comprises the secondary confinement boundary. Included within this boundary are the walls and roofs that make up the boundary. Several rooms are frequently used as air locks for moving materials in and out of the secondary confinement boundary without breaking confinement. They are not part of secondary confinement when the inner doors are closed.

Describe Weaknesses in the Design Basis

The labs and residual areas have not been evaluated to the current DOE standard DOE-STD-1020-94. The soil has not been characterized per current DOE standards.

Design basis of the HEPA filter equipment is unknown. The seismic and wind capacity of the equipment has not been evaluated to the current DOE standard DOE-STD-1020-94. The ventilation duct lines going from building to HEPA filters bunkers and then to the chimney stack are exposed to high winds, tornados, and missiles.

The seismic and high wind capacity of the neutron detector's (a total of three in this building) support system and the neutron detectors functionality during or after seismic or high wind events has not been determined.

tural Design

Reinforced concrete

Partitioned Areas of HEU within facility

storage wells

labs

residual areas

Description of Partitioned Areas

Storage Wells

Four sets of top-loaded, shielded storage wells for solid forms of fissionable material are accessible from the Penthouse of Building 3019. One set, an array of 68 wells was installed in the southwestern corner of Cell 4, beneath the 9-ft x 9-ft equipment hatch, primarily to store the solidified Consolidated Edison Uranium material. These wells are arranged in a 12-3/4-in. center to center triangular pattern and each consists of a carbon steel tank which is encased in a hexagonal concrete structure. The structure extends from the cell floor, which is below grade, to approximately 1 foot above the concrete hatch plug; thus each tank is approximately 30 feet long. The tanks inside 45 of the wells are constructed from 4-in.-diameter, Schedule 40 pipe, and the tanks inside the other 23 wells are constructed from 5-in.-diameter (outside), 0.25-in.-thick tubing. Each tank is vented through a manifold to the Vessel Off-Gas System, and the area immediately above each tank is shielded with a 2-ft-thick removable shield plug. Three sets of intercell storage wells (a total of 26 wells) are embedded in holes drilled in the 5-ft-thick concrete walls between, respectively, Cells 2 and 3, Cells 3 and 4, and Cells 4 and 5, and are accessible from the Penthouse. A 4-in.-diameter, Schedule 40 stainless steel tank serves as the storage well. Each of these tanks is also vented through a manifold to the Vessel Off-Gas System. The top of each well is shielded with an 8-inch-thick removable plug and is closed with a removable top plate.

;torage wells contain 2812 packages of U-233 in 1090 cans.

Laboratories

n 22 - Provide space for pilot scale radiochemical processes.

Room 22 (see Fig. 2) contains eigth glove boxes ventilated by the Glovebox Off-Gas system. These glove boxes contain tanks and support equipment that was used to convert 233-uranyl nitrate solutions to solid oxide forms which have been flushed are now in standby. As these gloveboxes are removed, other gloveboxes may be added to provide processing capability.

Room 26-Laboratory for waste characterization.

Room 26 (See Fig. 2) contains two gloveboxes joined together as one unit. The gloveboxes are ventilated by the Glovebox Off-Gas system. The gloveboxes are used for waste characterization. All equipment used for radioactive solutions has been flushed of recoverable radioactive materials and placed in standby.

Room 29- Provide access area to Cells 5, 6, and 7.

Room 29 (See Fig. 2) provides an access area to Cells 5, 6, and 7 which are enclosed. The Glovebox Off-Gas system pass through this room. There are currently no gloveboxes located in this room.

Room 107 and 108-Provide laboratories for the study of radionuclides, radioactive waste and for decontamination of tools and equipment.

Room 107 and 108 are chemical/radiochemical laboratories. The location of Room 107 and 108 is ilustrated in Fig 3. Contained in Rooms 107 and 108 are a total of 8 hoods used for the handling and study of low level radionuclides, radioactive waste and for decontamination of tools and equipment. The hoods are ventilated by Laboratory Off-Gas which is aportion of the Main Ventilation System. The quantity of radioactive materials that can be handled in a hood is controlled by Radiation Potection Procedures. Each hood is provided with a connection to the Building 3019 Liquid Low Level Waste collection tank (N-71) for disposal of chemical and radioactive wastes.

Room 110 - Provide laboratory for handling radionuclides.

Room 110 is a chemical/radiochemical laboratory and is located as illustrated in Fig. 3. Contained in Room 110 are 2 hoods for handling of radionuclides. The hoods are ventilated by Laboratory Off-Gas which is a portion of the Main Ventilation System. The quantity of radioactive materials that can be handled in a hood is controlled by Radiation Protection Procedures and criticality. Each hood is provided with a connection to the Building 3019 Liquid Low Level Waste collection tank (N-71) for disposal of chemical and radioactive waste. Several connections are provided to the Glove Box Off-Gas System although no gloveboxes are present in the room at this time. Gloveboxes are added as necessary to provide laboratory processing capability.

Room 112 - Provide laboratory for handling radionuclides

Room 112 is a chemical/radiochemical laboratory and is located as illustrated in Fig. 3. Contained in Room 112 is one hood for handling of radionuclides. The hood is ventilated by Laboratory Off-Gas which is a portion of the Main Ventilation System. The quantity of radioactive materials that can be handled in a hood is controlled by Radiation Protection Procedures and criticality. There is presently one glovebox in Room 112 that was used for finishing (e.g. packaging and sampling) oxides produced in Room. This glovebox has been wiped down and most equipment removed and is now in standby awaiting decontamination and decommissioning.

Room 113 - Provide laboratory for handling radionuclides and pilot scale experimental processes.

Room 113 is a chemical/radiochemical laboratory and is located as illustrated in Fig. 3. Contained in Room 113 is a hood ventilated by Laboratory Off-gas and Vessel Off-Gas. This hood contains process tanks and support equipment used to convert nitrate solutions to solid oxide forms. Several connections are provided to the Glove Box Off-Gas System although no gloveboxes are present in the room at this time.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE

Question 1: SITE

Room 114 - Provide laboratory for handling radionuclides.

Room 114 is a chemical/ radiochemical laboratory and is located as illustrated in Fig. 3. Contained in Room 114 are two gloveboxes used for the handling of radionuclides. The quantity of radioactive materials that can be handled in the gloveboxes is controlled by Radiation Protection Procedures and nuclear criticality safety. One of the gloveboxes is provided with a connection to the Building 3019 Liquid Low Level Waste collection tank for disposal of chemical and radioactive waste. The gloveboxes are ventilated by the Glovebox Off-Gas system.

Room 142 - Provide space for chemical preparation for incell processes.

Room 142 (See Fig. 3) is a process makeup room through which the Glovebox Off-Gas system passes. There are currently no gloveboxes located in this room.

Room 144 - Provide space for chemical preparation for incell processes.

Room 144 (See Fig. 3) is a process makeup room with one glovebox previously used for sampling the Uranium Storage Tanks (which are located in the center pipe tunnel, Room 25C, below Room 144). The glovebox is ventilated to the Glovebox Off-Gas system. All equipment used for radioactive solutions has been flushed of recoverable radioactive materials and placed in standby awaiting decontamination and decommissioning.

Room 150 - Provide equipment and space necessary for remote sampling of in cell vessels.

Room 150 (See Fig. 3) is a sampling area containing two gloveboxes. The eastern glovebox was previously used for CEUSP sampling and is ventilated to Cell Off-Gas through the Cell 3 CEUSP gloveboxes and Cell 4. All equipment used for radioactive solutions has been flushed of recoverable radioactive materials and placed in standby awaiting decontamination and ommissioning.

The western glovebox in Room 150 is used to support remote sampling of vessels contained in Cells 5, 6, and 7. This glovebox is ventilated to the Glovebox Off-Gas system. It is connected to a shielded manipulator box which, in turn, is connected to a shielded conveyor by which sample bottles are transported to selected tank samplers adjacent to Cells 5, 6, and 7. Filled sample bottles are removed from the sampling system via the conveyor, shielded manipulator box and glovebox.

Residual Areas

Shielded Remote Processing Cells 1-7: Provide for shielded remote processing capabilities of Fissionable and/or Radioactive Material.

Plan views of the shielded remote processing cells are shown in Fig. 2. Cell 1 has nominal floor dimensions of 10 x 20 ft., whereas each of Cells 2-7 has nominal floor dimensions of 20 x 20 ft.; all of the cells have nominal floor-to ceiling heights of 27 ft. Cells 6 and 7 are interconnected (with no shield wall between them) and are separated only by curbing and a partial wall.

All cell walls are built of poured, reinforced concrete. The outer walls on the north, east, and west sides have a thickness of approximately 5 ft., and those on the south side and the top have a thickness of approximately 4 ft. The interior walls separating the cells have a nominal thickness of 5 ft.

Each cell has a hatch in the southwestern corner of the cell roof (approximately 9 x 9 ft.); this hatch is used primarily as an equipment portal. However, in Cell 4, the equipment hatch and the cell space beneath it have been displaced by the installation of a group of storage wells for solid forms of fissile and/or other radionuclides.

Personnel access to and from each cell is provided by a door on the south side of the cell at floor level accessed by a stairway descending from an adjacent plenum area. An exception to this is Cell 6 where the door is on the plenum level (in room 29), approximately 12 ft. above the cell floor level, and a ladder to the cell floor level is located inside the cell. In Cells 1, 2, 3, 5, and 7, the entrance stairways are enclosed, and the doors are bulkhead type which may be battened shut (Cell 6 has a plate-type door).

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE

Question 1: SITE

Ventilation air is supplied to the top of each stairwell via a roughing filter from the adjacent plenum room and is exhausted via the stairwell into the cell. No personnel access is permitted to Cell 4.

Piping penetrations are located in the roof of each cell and in most of the cell walls. Thus, piping connections to and from equipment in the cells extend into the pipe tunnels, the chemical makeup rooms, the Penthouse, the Sample Gallery, the cell [illegible] areas, the Oxide Preparation Facility, and the "BT" and TRUST tank pit area.

The floors of the cells have been divided by curbing and some walls into various work areas, as illustrated in Fig. 2. Cells [illegible] 7 each contain a sump. An overflow port at the top of each sump is piped to a manifold which drains to the ORNL Liquid Low-Level Waste (LLLW) system. The sumps in several of the cells have been modified. In Cells 5, 6, and 7, the floors have been covered [illegible] stainless steel liners which extend to various heights up the side walls of the cell. Liquid drains have been located in the liners underneath specific equipment. These drains are connected to the cell sumps by piping located underneath the liners. The [illegible] in Cells 5, 6, and 7 have been packed with borosilicate glass raschig rings, the overflow ports have been welded shut, liquid level detector probes have been installed, and transfer lines (through which any liquid that is collected can be recovered) have been provided. In Cell 5, a second sump has been installed to accommodate the extended length of a solvent extraction column. In [illegible] stainless steel floor liner has been ins alled and has been sloped to drain to a sump near the personnel door.

Cell 3 contains two gloveboxes previously used for the CEUSP program (now placed in standby). Each glovebox is mounted [illegible] cell wall and surrounded by lead shielding to reduce radiation exposure. The gloveboxes are ventilated by Cell Off-Gas [illegible] 4.

The process equipment contained in the other cells consists of vessels, piping, and pumps that were used to process and [illegible] solutions containing radioactive materials, and those vessels used to store and feed non-radioactive solutions. Processing equipment used for radioactive solutions has been flushed of recoverable radioactive materials and placed in standby.

[illegible]ST and BT Pit: Provide enclosed space for tanks P-23, 24 and 25.

The location of the BT Pit and the Thorium Reactor Uranium Storage Tank (TRUST) Facility within the RDF is illustrated [illegible] The BT Pit originally included the 5000-gal. tank, P-25 (now called the TRUST Facility), as well as the two 10,000-gal. tanks, P-23 [illegible] P-24 which were used to store concentrated thorium nitrate solutions. All three tanks are 9-ft.-diam. cylindrical tanks with [illegible] heads and are mounted horizontally below ground level. The BT Pit was constructed of normal concrete with 16-in.-thick [illegible] 12-in.-thick roof plugs and stacked concrete-block partition inner walls. Tank P-24 currently contains ~ 15,000 L of thorium [illegible] solution slightly contaminated with U-233.

Prior to receipt of the Consolidated Edison Uranium solution at ORNL in 1968, the east end of the pit and the 5000-gal. tank [illegible] upgraded to form the TRUST Facility. The eastern end of the pit was modified by (1) adding a 2-ft. thickness of barytes concrete [illegible] upper outside walls (as shown in Fig. 2.4.10), (2) replacing the inner wall with a poured 2-ft.-thick barytes concrete wall, (3) constructing 3-ft.-thick barytes concrete roof plugs, (4) adding a stainless steel floor, sump and side wall liner (to a height of [illegible] (5) installing instrumentation, piping, and ventilation ducts. The tank was thoroughly inspected and filled with borosilicate glass raschig rings (which occupy 34% of the tank volume).

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE

Question 1: SITE

ount & Location of Hazardous Material Collocated or Commingled with HEU

D is comingled with CEUSP material.

Process Material Transfers

Hazard Category II quantities are transported in casks or shipping drums. Lesser quantities are transported in other convenient handling devices.

Cans containing radioactive material are put into or retrieved from the storage wells by means of a vacuum actuated device or a magnetic actuated device which can be used in conjuction with a shielded transfer cask.

On-Site Transportation

All on-site transportation is done in accordance with ORNL site policies.

Staff Levels & Experience

	Number of Employees	Avg. Building Experience (yr)	Range (yr)
Supervisory	2	18	17-20
Technician	4	1	1-4
Health Physics Technician	5	5	3-20
Maintenance	3	3	3-10
Management	3	8	1-20

These levels are adequate for current building operations.

plicable References

is for Interim Operation Building 3019 Complex - Radiochemical Development Facility (RDF), BIO/3019-CTD/SSE/R0, Approved by DOE June 1996.

Operational Safety Requirements for the Radiochemical Devleopment Facility, Chemical Technology Division, OSR/3019-CTD/R1, 12/1/95.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

F ach partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. low for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[1]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify)	[Y] Material Limts
[Y] Duct	[ ] Liquid Containment/Dike	(e.g., Mass	[Y] Monitoring
[ ] Filter	[Y] Bay, Cells, Magazines	Absorbers	[Y] Configuration Control
[ ] Vault	[ ] Canyons	Geometry	[Y] Quality Assurance
[Y] Room	[ ] Pads	Interaction	[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary	Concentration	[Y] Authorization Basis
[ ] Hood	[ ] Trenches	Moderation	[Y] Training
[ ] Piping	[ ] Storage Vault	Enrichment	[Y] Organization
[Y] Shielding	[Y] Fire Suppression	Reflection	[Y] Lessons-Learned
[Y] Distance	[Y] Alarm System	Volume)	[ ] Testing
[ ] Respiratory Protection	[Y] Other - Specify		[ ] Trending
[Y] Protective Clothing	ventilated, shielded storage wells		[Y] Records
[Y] Remote Handling			[ ] Standards
[Y] Confinement System			[Y] External Regulation
Burial Ground			[Y] Surveillance
[ ] Tanks			[Y] Personnel Reliability Assurance Program
[Y] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emergency Response
[Y] Other-specify			[ ] Other-specify
ventilated, shielded storage wells; Criticality Accident Alarm System			
None			

1 Barriers between HEU and worker

rriers between HEU and public/environment.

udes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells

Question 2: BARRIER TYPES

r ribe each barrier identified above and its intended protective functions.

..ker Barrier Narrative:

Duct & Ventilation

U-233/HEU is stored in wells described above that are ventilated through pipe ducts (called vessel off gas (VOG) system). The main air handling or the VOG is provided by the ORNL gaseous waste handling system. The VOG system is connected to the ORNL system via an underground stainless steel duct. The ORNL system provides up to 50 inches water gauge (IWG) of negative pressure which is reduced to a nominal 5 to 10 IWG negative pressure in the RDF. Besides blowers to motivate air movement, the ORNL system treats off gas with scrubbers and high efficiency particulate air (HEPA) filters before being discharged to the atmosphere via a 250-ft-tall stack.

A side stream of VOG flow is routed to the cell off-gas (COG) branch of the RDF's main building ventilation system. This connection provides backup in the event that the ORNL system is unavailable.

The VOG system is aging and shows signs of deterioration. Plans have been made and funding has been acquired to replace/upgrade the aging components.

Room & Confinement System

U-233/HEU storage wells are accessed in an enclosed room which is kept under a slight negative pressure (~0.3 IWG) which is ventilated via the main building ventilation system. This system exhausts the room air (via adjacent process canyons) to either of two branches (valved to provide redundant, path-of-least-resistance flow) - the cell off-gas (COG) or the lab off-gas (LOG). Each of these systems routes exhausted air through HEPA filters and a pair of fans which discharge the filtered air to the atmosphere via a 200-foot-tall stack. Standby electric power is provided for these fans by diesel-powered generators. One branch and part of the other is 10 years old and is fabricated out of stainless steel. The other branch also has a portion that is aging mild steel which is planned for replacement in the near future.

:/Environment Barrier Narrative:

..ility/Building Boundary & HVAC/Confinement

The duct, room, and confinement system components, which also protect the worker, plus exterior ducts and HEPA filters, serve to protect the public and environment. See appropriate descriptions under worker barriers.

Fire Suppression

A permanently installed, automatically actuated fire suppression system protects the building boundary from catastrophic fire damage.

The RDF is connected to the ORNL fire-protection water system at the fire equipment room (Room 21) on the south side of the building (near the building's southwest corner). Control valves and volume-limiting timers are located at this point. Most of the building is protected by a conventional automatic wet-type sprinkler system. Exceptions to this general plan are Cells 3, 5, 6, and 7, and the Building 3100 Vault which are protected by a dry pipe system. The dry pipe sprinkler system is used where a potential exists for water freezing in outside pipe runs. For most of these systems, the water supply is held back by valves automatically-actuated by heat detectors.

The wet pipe system is equipped with sprinkler heads that will open to allow water spray until the water header supply is manually cut off. Also located in these sprinkler headers are flow switches that will send an alarm to the Fire Department in the event that a sprinkler head opens and allows water to flow through the header. The wet pipe system is served by Risers #1 and #2 located in the fire equipment room (Room 21).

The fire zone identification system is located at the Emergency Control Center (ECC) on the north side of Building 3019 outside Room 121. The system consists of a series of lights numbered from 1 to 24. These lights (and the building's audible fire alarms) are actuated either by a flow switch located in the sprinkler header or by a heat detector. A sign describing the location and type of sprinkler system for each zone is posted near the zone lights. The sign also describes other special provisions that may be incorporated in the ...pment for each zone (e.g., automatic timed cut-off valves).

...e RDF is served by master fire alarm boxes and auxiliary fire boxes. When a master fire box is actuated (either directly or indirectly by a signal from one of the auxiliary boxes), an alarm is automatically transmitted to the Fire Department indicating the master box number, the appropriate fire zone identification light is activated, and the building's audible alarm is sounded.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells
Question 2: BARRIER TYPES	

r ribe each barrier identified above and its intended protective functions.

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: storage wells

Question 2: BARRIER TYPES

[ ]e each barrier identified above and its intended protective functions.

SITE

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Alarm System

Site area monitors are located around the ORNL site and monitor air emissions.

Criticality Barrier Narrative:

NCS is maintained by a combination of mass, geometry, and concentration controls; and by limiting neutron interactions with materials in adjacent wells.

Administrative controls limit the allowable fissionable material mass to less than the ORNL Facility Material Control Limit (FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area without formal NCS approval. For HEU, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality incident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.

Personnel are trained to current procedures.

Authorization basis is current and approved.

Material limits are established for hoods and storage areas.

[ ]ration control exists for storage positions.

Worker access is controlled to partitioned areas. Penthouse is normally locked and requires authorization from Security and facility management for entry.

Records are maintained, systems are monitored and tested, and the building inspected on a predetermined schedule.

Routine programs for monitoring and surveillance are in place.

Organization is defined, and a lessons-learned program has been implemented.

Conduct of operations has been established for facility.

Emergency response is provided on a 24 hour per day basis.

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: storage wells

Question 3: HEU Holdings and Packaging

.terial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	U-233>10 ppm	Impure Oxides	V1, welded	Other-specify storage wells	31-32 years	134	57.000
Oxides	U-233>10 ppm	Impure Oxides	V1, C0	Other-specify storage wells	10 years	27	60.000
Oxides	U-233<10 ppm	Pure oxides	V1, C0	Other-specify storage wells	17-18 years	1743	48.000
Oxides	U-233>10 ppm	Impure Oxides	V1, welded	Other-specify storage wells	31-32 years	27	11.000
Compounds	U-233>10 ppm	Other	V4, V5	Other-specify storage wells	28 years	1	0.3000
Compounds	U-233>10 ppm	Other	V5, screwed plug	Other-specify storage wells	28 years	4	1.6000
Compounds	U-233>10 ppm	Other	V1, B0, stoppered	Other-specify storage wells	28 years	6	0.5000
Compounds	U-233>10 ppm	Other	V1, B0, stoppered,	Other-specify storage wells	28 years	6	0.5000
Oxides	U-233<10 ppm	Pure oxides	V1, C0	Other-specify storage wells	17-18 years	10	0.2000
Oxides	U-233<10 ppm	Pure oxides	V5, B1, C0	Other-specify storage wells	17-18 years	15	0.2000
Oxides	U-233<10 ppm	Impure Oxides	V5, B1, C0	Other-specify storage wells	9-12 years	21	0.4000
‌ies	U-233<10 ppm	Impure Oxides	bolt-on cap, B2,	Other-specify storage wells	17 years	2	1.2000

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SITE: Oak Ridge National Laboratory				FACILITY (Building or Location) Building 3019			
				PARTITIONED AREA: storage wells			

Question 3: HEU Holdings and Packaging

:rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	U-233<10 ppm	Impure Oxides	V5, B2, C0	Other-specify storage wells	14 years	5	1.4000
Oxides	U-233<10 ppm	Impure Oxides	U2, B0, C0	Other-specify storage wells	22-23 years	4	1.7000
Metal	U-233>10 ppm	Pure metal	V1	Other-specify storage wells	16 years	2	5.800
Metal	U-233<10 ppm	Pure metal	V5, information not	Other-specify storage wells	17 years	4	0.500
Metal	U-233<10 ppm	Impure	V1, C0	Other-specify storage wells	not available	6	0.600
Compounds	U-233>10 ppm	Other	V1, C0	Other-specify storage wells	>13 years	6	0.900
Oxides	U-233<10 ppm	Impure Oxides	C0, C1	Other-specify storage wells	13 years	2	1.10
Metal	U-233<10 ppm	Impure	C0, C1	Other-specify storage wells	16 years	2	1.30
Metal	U-233<10 ppm	Impure	V1, C0	Other-specify storage wells	> 8 years	4	0.60
Oxides	U-233<10 ppm	Impure Oxides	G1, B0, C0	Other-specify storage wells	12 years	3	0.0[illegible]
M t l							

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: storage wells

Question 3: HEU Holdings and Packaging

.erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Compounds	U-233<10 ppm	Other	G2, G1, B0, C0	Other-specify storage wells	12 years	1	0.0003
Oxides	U-233<10 ppm	Other	press-fit lid, B0,	Other-specify storage wells	21 years	12	0.0200
Metal	U-233>10 ppm	Impure	V5, B0, C0	Other-specify storage wells	11 years	1	0.1000
Metal	U-233<10 ppm	Pure metal	V1, C1	Other-specify storage wells	11 years	4	0.2000
Metal	U-233>10 ppm	Pure metal	U0, C0	Other-specify storage wells	not available	1	0.0100
[illegible]	U-233<10 ppm	Pure metal	B0, C0	Other-specify storage wells	>11 years	2	0.5000
Oxides	U-233<10 ppm	Impure Oxides	V1, C0	Other-specify storage wells	21 years	3	1.0000
Oxides	U-233<10 ppm	Impure Oxides	U0, U1	Other-specify storage wells	30-31 years	12	2.9000
Oxides	U-233<10 ppm	Pure oxides	P0, B1, C0	Other-specify storage wells	13 years	10	0.0700
Oxides	U-233<10 ppm	Impure Oxides	C1, V1	Other-specify storage wells	12 years	1	0.3000
Oxides	U-233>10 ppm	Other	V5, B1, C0	Other-specify storage wells	22 years	1	0.700
	U-233<10 ppm	Pure metal	G1, C0	Other-specify storage wells	11 years	1	0.030

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: storage wells

Question 3: HEU Holdings and Packaging

.erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	U-233<10 ppm	Impure Oxides	V1, welded	Other-specify storage wells	26 years	6	3.0000
Metal	U-233>10 ppm	Pure metal	V1, C1	Other-specify storage wells	12 years	1	0.1000
Oxides	U-233>10 ppm	Other	V5, B0, C0	Other-specify storage wells	11 years	1	0.1000
Metal	U-233<10 ppm	Pure metal	V5, B0, C0	Other-specify storage wells	11 years	1	0.1000
Compounds	U-233<10 ppm	Other	V5, B0, C0	Other-specify storage wells	8 years	1	0.0600
Compounds	U-233<10 ppm	Other	V5, B0, C0	Other-specify storage wells	17 years	1	0.2000
Oxides	U-233<10 ppm	Impure Oxides	C1, B0, C0	Other-specify storage wells	17 years	1	0.0800
	U-233>10 ppm		V1, C1	Other-specify storage wells	12 years	1	0.0030
Metal	U-233<10 ppm	Pure metal	C1, C0	Other-specify storage wells	13 years	3	0.0200
Oxides	U-233>10 ppm	Other	C2, V1	Other-specify storage wells	12 years	5	0.3000
Oxides	U-233<10 ppm	Other	C2, V1	Other-specify storage wells	12 years	1	0.0300
[illegible]es	U-233<10 ppm	Other	U1, B0, C0	Other-specify storage wells	24 years	1	0.2000

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: storage wells

Question 3: HEU Holdings and Packaging

...rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	U-233<10 ppm	Other	G1, B0, C0	Other-specify storage wells	18 years	6	0.2000
Oxides	U-233<10 ppm	Other	V5, B0, C0	storage wells	8 years	6	0.0700
Oxides	U-233<10 ppm	Pure oxides	G1, B0, C0	Other-specify storage wells	16 years	2	0.0090
Oxides	U-233<10 ppm	Other	V5, C0	Other-specify storage wells	11 years	1	0.0800
Oxides	U-233<10 ppm	Other	V5, B0, C0	Other-specify storage wells	11 years	2	0.3000
[illegible]es	U-233<10 ppm	Other	G1, B0, C0	Other-specify storage wells	20 years	11	0.3000
Oxides	U-233<10 ppm	Impure Oxides	G1, B0, C0	Other-specify storage wells	23 years	3	0.0500
Oxides	U-233>10 ppm	Impure Oxides	V1, C0	Other-specify storage well	10-11 years	403	104.00
Oxides	U-233<10 ppm	Pure oxides	V5, B1, C0	Other-specify storage wells	20 years	44	15.000
Oxides	U-233<10 ppm	Impure Oxides	V5, B1, C0	Other-specify storage well	8-16 years	206	91.000
Metal	U-233<10 ppm	Impure	press-fit lid, B0,	Other-specify storage wells	17 years	4	1.5000
[illegible]s	U-233<10 ppm	Impure Oxides	V1, C1	Other-specify storage wells	> 16 years	6	2.2000

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SITE: Oak Ridge National Laboratory

FACILITY (Building or Location) Building 3019

PARTITIONED AREA: storage wells

Question 3: HEU Holdings and Packaging

...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	U-233<10 ppm	Pure metal	stainless steel, B0	Other-specify storage wells	12 years	2	0.01[illegible]
Metal	U-233<10 ppm	Pure metal	V1, C1	Other-specify storage wells	17 years	3	0.50
Metal	U-233<10 ppm	Pure metal	U0, C0	Other-specify storage wells	17 years	1	0.01
Metal	U-233>10 ppm	Impure	V5, B1, C0	Other-specify storage wells	22 years	4	4.2[illegible]

ribe material at risk, which constitutes a source term.

Total Net Quanity = 97 kg
Avg. U wt. % = 67
Avg. U-233 enrichment = 92 wt. %

Separation Process: not available
Date Separated: not available
Stabilization Temperature = 700 C

Describe packaging and its intended protective function(s).

Item group: ANL-ZPR
1743 containers

Primary container - 304L Stainless Steel
3x2x1/4 in.
welded closure
no outer bagging

Secondary container - Tinplate
3-7/8 in. diam.
8 in. length
double seamed closure

packaged by ORNL RDF

Describe material at risk, which constitutes a source term.

Item Group: ANL-ZPR
Chemical Compound: U3O8
Form: Powder

Total net quantity = 58 kg
Avg. U wt. % = 85
Avg. enrichment U-233 = 98 wt. %

Separation Process: Ion Exchange
Date Separated: 1978-1979
Stabilization Temperature = 800 C

Describe packaging and its intended protective function(s).

Item group: RCP-02
27 containers

ary Container - Aluminum
dimensions not available
welded closure
no outer bagging

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

Secondary Container - Aluminum
2.6 in. diam.
8 in. length
welded closure

packaged by Savanah River Plant

Describe material at risk, which constitutes a source term.
Item Group: RCP-02
Chemical Compound: U3O8
Form: Powder

Total net quantity = 13 kg
Avg. U wt. % = 85
Avg. enrichment U-233 = 96%

Separation Process: not available
Date Separated: not available
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item Group: UF4
1 container

ary container - Stainless Steel
1-1/2 in. Sch. 40 Pipe
17 in. length
compression fittings
no outer bagging

Secondary container - Aluminum
3 in. OD Tubing
23 in. length
screwed plug

packaged by ORNL Thorium Uranium Recycle Facility

Describe material at risk, which constitutes a source term.
Item Group: UF4
Chemical Compound: UF4 w/ > 1000 ppm LiF
Form: Fused Salt

Total net quantity = 0.5 kg
Avg. U wt% = 61
Avg. enrichment U-233 = 91 wt. %

Separation Process: Purex at Savannah River Plant
Separated: 1964-1965
Stabilization Temperature = 855 C

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

ibe material at risk, which constitutes a source term.

/. g. U wt. % = 61

Avg. enrichment U-233 = 91 wt. %

Separation Process: Purex at Savannah River Plant

Date Separated: 1964=1965

Stablilization Temperature = 855 C

Describe packaging and its intended protective function(s).

Item group: UF4

6 containers

Primary container - Nickel
3/4 in. diam.
6 in. length
welded closure (information inferred from available sketches or obtained by interview with task leader)
plastic tube outer bagging

Secondary container - Aluminum
3-1/2 in. OD tubing
8-3/4 in. length
stoppered closure

packaged by ORNL Thorium Uranium Recycle Facility

ribe material at risk, which constitutes a source term.

Item Group: UF4

Chemical Compound: UF4

Form: fused salt

Total net quantity = 0.9 kg

Avg. U wt.% = 61

Avg. enrichment U-233 = 91 wt. %

Separation Process: Purex at Savannah River Plant

Date Separated: 1964-1965

Stabilization Temperature = 855 C

Describe packaging and its intended protective function(s).

Item Group: ANL-10

10 containers

Primary container - Stainless Steel
3x2x1/4 in.
Welded closure
no outer bagging

Secondary container - Tinplated steel
4-1/16 in. diam.
7 in. length
double seamed closure

packaged by ORNL RDF

-ribe packaging and its intended protective function(s).

group: ARF-35
5 containers

Primary container - Steel
3-1/8 in. diameter
7-3/4 in. length
screw cap
PVC outer bagging

Secondary container - Tinplated steel
3-7/8 in. diam.
8 in. length
double seamed closure

packaged by Rocky Flats Plant

Describe material at risk, which constitutes a source term.
Item Group: ARF-35
Chemical Compound: Oxide
Form: Powder

Total net quantity = 2.3 kg
wt.% U = 60
enrichment U-233 = 98 wt.%

Separation process: not available
Date Separated: Pre-1983 (inferred from descriptions)
Stabilization temperature: not available

Describe packaging and its intended protective function(s).
Item group: ASA-94
4 containers

Primary container - (based on recollection of person involved in packaging or receiving)
plastic
dimensions not available
plastic outer bagging

Secondary container - tinplated steel
dimensions not available
pressed on lid

packaged by Lawrence Livermore National Lab

Describe material at risk, which constitutes a source term.
group: ASA-94
nical compound: Oxide
Form: not available

Total net quantity = 2.2 kg

·ibe material at risk, which constitutes a source term.

wt.% U= 77
Avg. enrichment U-233 = 98 wt. %

Separation Process: not available
Date Separated: Pre-1974 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: AUA-67/70
2 containers

Primary container - stainless steel
3-7/8 in. diam.
2-3/8 in. length
welded closure
no outer bagging

packaged by Los Alamos National Laboratory

Describe material at risk, which constitutes a source term.

Group: AUA-67/70
.ical Compound: U
Form: Ingot

Total net quantity = 6.0 kg
Avg. U wt. % = 100 (inferred from descriptions)
Avg. enrichment U-233 = 97 wt.%

Separation Process: not available
Date Separated: Pre-1977 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: AUA-84
4 containers

Primary container - screw cap (inferred from description)
further information not available

Secondary container - stainless steel 3-1/16 in. diam.
6-7/8 in. length
welded closure

aged by Los Alamos National Laboratory

Describe material at risk, which constitutes a source term.

Item group: AUA-84

'be material at risk, which constitutes a source term.

C .iical Compound: U
Form: Button (inferred from descriptions)

Total net quantity = 0.5 kg
Avg. U wt.% = 100
Avg. enrichment U-233 = 98 wt. %

Separation process: not available
Date separated: Pre-1967 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item gioup: CZA-90
6 containers

P.imary container - stainless steel
2x2x1/8 in. or 2x2x1/4 in.
welded closure
no outer bagging

Secondary container - tinplated steel
dimensions not available
double seamed closure

packaged by Argonne National Laboratory East, Illinois

Describe material at risk, which constitutes a source term.

Item group: CZA-90
Chemical Compound: U
Form: not available

Total net quantity = 0.8 kg
Avg. wt.% U = 74%
Avg. enrichment U-233 = 98 wt. %

Separation Process: not available
Date Separated: Pre-1984
Stabilization temperature: not available

Describe packaging and its intended protective function(s).

Item group: CZA-91
6 containers

1 Primary container - stainless steel
2x2x1/4 in.
welded closure
no outer bagging

Secondary container - tinplated steel

dimensions not available
double seamed closure

packaged by Argonne National Laboratory East, Illinois

Describe material at risk, which constitutes a source term.

Item group: CZA-91
Chemical Compound: not available
Form: not available

Total net quantity = 1.1 kg
Avg. wt.% U = 84
Avg. enrichment U-233 = 97 wt.%

Separation Process: not available
Date Separated: Pre-1984 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: CZA-93
2 containers

Primary Container - tinplated steel
dimensions not available
double seamed closure (based on recollections of person involved in packaging or receiving)
outer bagging data not available

Secondary Container - Stainless Steel
3.5 in. diam.
13 in. length
welded closure

packaged by Argonne National Laboratory East, Illinois

Describe material at risk, which constitutes a source term.

Item group: CZA-93
Chemical compounds: UO_2, U
Form: Granules(oxide), pieces & foils(metal)

Total net quantity = 1.2 kg
Avg. wt.% U = 91
Avg. enrichment U-233 = 98

Separation Process: not available
Date Separated: Pre-1984 (inferred from descriptions)
Stabilization Temperature: not available

·ribe packaging and its intended protective function(s).

group: CZA-93
2 containers

Primary container - tinplated steel
dimensions not available
double seamed closure (based on recollections of person involved in packaging or receiving)
outer bagging data not available

Secondary container - stainless steel
3.5 in. diam.
13 in. length
welded closure

packaged by Argonne National Laboratory East, Illinois

Describe material at risk, which constitutes a source term.

Item group: CZA-93
Chemical Compound: U
Form: Buttons and plates

Total net quantity = 1.3 kg
Avg. wt.% U = 100
Avg. enrichment U-233 = 98 wt.%

.ration Process: not available
Date Separated: Pre-1984 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: CZC-7B
4 containers

primary container - stainless steel
2x2x1/4 in. or 3x2x1/4 in.
welded closure
no outer bagging

secondary container - tinplated steel
3-7/8 in. diam.
8 in. length
double seamed closure

packaged by Argonne National Laboratory West, Idaho

Describe material at risk, which constitutes a source term.

group: CZC-7B
.mical Compound: U
Form: not available

Total net quantity = 0.6 kg

tinplated steel
double seamed closure
dimensions not available

packaged by Brookhaven National Laboratory

Describe material at risk, which constitutes a source term.
Item group: CZD-G
Chemical Compound: U
Form: Foil

Total net quantity = 0.02
Avg. wt.% U = 85 (inferred from descriptions)
Avg. enrichment U-233 = 96 wt.%

Separation Process: not available
Date Separated: Pre-1960 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item group: CZD-G
1 containers

ry container - glass
screw cap
dimensions not available
plastic outer bagging

secondary container - inferred from description
tinplated steel
double seamed closure
dimensions not available

packaged by Brookhaven National Laboratory

Describe material at risk, which constitutes a source term.
Item group: CZD-G
Chemical Compound: U
Form: Piece (inferred from descriptions)

Total net quantity = 0.01
Avg. wt.% U < 100 (inferred from descriptions)
Avg. enrichment U-233 = 99 wt.%

Separation process: not available
Date Separated: Pre-1970 (inferred from descriptions)
Stabilization Temperature: not available

SITE:

-ribe material at risk, which constitutes a source term.

Separated: 1966

Stabilization Temperature = 800 C (inferred from descriptions)

Describe packaging and its intended protective function(s).

Item group: JZBL

1 container

primary container - tinplated steel

3 in. diam. x 7-5/8 length

screw cap (inferred from descriptions)

plastic outer bagging

secondary container - tinplated steel

3-3/4 in. x 8 in. length

double seamed closure (inferred from descriptions)

packaged by ORNL

Describe material at risk, which constitutes a source term.

Item Group: JZBL

Chemical Compound: U

Form: Pieces

net quantity = 0.1 kg

Avg. wt.% U = 100

Avg. enrichment U-233 = 98

Separation Process: not available

Date Separated: Pre-1963

Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: KZA-G1B

4 containers

primary container - stainless steel (based on recollection of person involved in packaging or receiving)

dimensions not available

welded closure

outer bagging data not available

secondary container - stainless steel

3 in. diam. x 6 in. length (based on recollection of person involved in packaging or receiving)

welded closure

packaged by Knolls Atomic Power Laboratory

-scribe material at risk, which constitutes a source term.

Item Group: KZA-G1B

Chemical Compound: U

ribe material at risk, which constitutes a source term.

. not available

Total net quantity = 0.2
Avg. wt.% U = 100 (inferred from descriptions)
Avg. enrichment U-233 = 100 wt %

Separation process: not available
Date Separated: Pre-1985 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: LAE-03
1 container

primary container - data not available

secondary container - tinplated steel
4-1/8 in. diam. x 7 in. length
double seamed closure

packaged by Atomics International (Divsion of North America Rockwell)

Describe material at risk, which constitutes a source term.

Group: LAE-03
ical Compound: U
Form: not available

Total net quantity = 0.01
Avg. wt.% U = 100
Avg. enrichment U-233 = 100 wt.% (inferred from descriptions)

Separation Process: not available
Separation Date: Pre-1971
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item Group: LAW-40
2 containers

primary container - plastic bagging
heat seamed closure

secondary container - tinplated steel
4-1/8 in. x 7 in.
double seamed closure

aged by Gulf Energy & Environmental Systems, San Diego, California

ibe material at risk, which constitutes a source term.

roup: LAW-40
Chemical Compound: U
Form: Discs

Total net quantity = 0.5 kg
Avg. wt.% U = 100 (inferred from descriptions)
Avg. enrichment U-233 = 97

Separation process: not available
Separation date: Pre-1974 (inferred from descriptions)
Stabilization temperature: not available

Describe packaging and its intended protective function(s).

Item group: LZB-18
3 containers

primary container: stainless steel
dimensions not available
welded closure

secondary container: tinplated steel
dimensions not available
double seamed closure (based on recollections of person involved in packaging or receiving)

packaged by Lawrence Livermore National Laboratory

Describe material at risk, which constitutes a source term.

Item Group: LZB-18
Chemical Compound: Oxide
Form: not available

Total net quantity = 1.2 kg
Avg. wt.% U = 85
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Separation Date: Pre-1975 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: LZB-22
12 containers

primary container - information not available

ndary container - metal based on recollections of person involved in packaging or receiving

packaged by Savannah River Plant

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

:ribe material at risk, which constitutes a source term.
.ı Group: LZB-22
Chemical Compound: Oxide
Form: Powder

Total net quantity = 3.6 kg
Avg. wt.% U = 83
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Date Separated: Pre-1966 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
item group: OX-225LP
10 containers

primary container - polyethylene with screw cap
1 in. diam x 2 in. length
polyethylene outer bagging

secondary container - tinplated steel
3-7/8 in. diam x 8 in. length
double seamed closure

packaged by ORNL RDF

Describe material at risk, which constitutes a source term.
Item Group: OX-225LP
Chemical Compound: U3O8
Form: Powder

Total net quantity = 0.1 kg
Avg. wt.% U = 76
Avg. enrichment U-233 = 98 wt.%

Separation Process: Ion Exchange
Date Separated: 1983
Stabilization Temperature = 800 C

Describe packaging and its intended protective function(s).
Item group: PZA-126
1 container

primary container - stainless steel
1.5 in. diam.
length and outer bagging information not available

secondary container - stainless steel
2.5 in. diam. x 9 in. length
welded closure

aged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: PZA-126
Chemical Compound: Oxide
Form: not available

Total net quantity = 0.3
Avg. wt.% U = 85 (inferred from descriptions)
Avg. enrichment U-233 = 99 wt.%

Separation Process: not available
Separation Date: 1982 (inferred from descriptions)
Stabilization Temperation: not available

Describe packaging and its intended protective function(s).
Item group: RCP-20
1 container

primary container - tinplated steel with screw cap
3 in. diam. x 7-5/8 in. length
polythylene outer bagging

ndary container - tinplated steel
3-3/4 in. diam x 8 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: RCP-20
Chemical Compound: Oxide
Form: Powder

Total net quantity = 0.8 kg
Avg. U wt.% = 83
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Date Separated: Pre-1963 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item Group: SNM-4031
1 container

.iary container - glass
screw cap closure inferred from description
dimensions and outer bagging information not available

dary container - tinplated steel
4-1/8 in diam x 7 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: SNM-4031
Chemical Compound: U
Form: Casting

Total net quantity = 0.03 kg
Avg. wt.% U = 100
Avg. enrichment U-233 = 100 wt.%

Separation Process: not available
Separation Date: Pre-1976
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item group: SRO-9
6 containers

ry container - Aluminum
2.5 in. diam x 11 in. length
welded closure
no outer bagging

secondary container - Aluminum
3 in. diam. x 12 in. length
welded closure

packaged by Savannah River Plant

Describe material at risk, which constitutes a source term.
Item group: SRO-9
Chemical Compound: Oxide
Form: Powder

Total net quantity = 3.8 kg
Avg. wt.% U = 81
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Date Separated: 1970 (inferred from descriptions)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

roup: TAR-LB1
.ainer

primary container - stainless steel
dimensions not available
welded closure
no outer bagging

secondary container - stainless steel
2.5 in. diam. x 8 in. length
welded closure

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: TAR-LB1
Chemical Compound: U
Form: Water

Total net quantity = 0.1 kg
Avg. wt.% U = 100 (inferred from descriptions)
Avg. enrichment U-233 = 100 wt.%

Separation process: not available
ation date: Pre-1985 (inferred from descriptions)
zation Temperature: not available

Describe packaging and its intended protective function(s).
Item group: Y-12
1 container

primary container - tinplated steel
3 in diam. x 7-5/8 in. length
screw cap and plastic outer bagging based on recollections of person involved in packaging or receiving

secondary container - tinplated steel
3-3/4 in. diam. x 8 in. length
double seamed closure based on recollections of person involved in packaging or receiving

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: Y-12
Chemical Compound: U_3O_8
Form: not available

Total net quantity = 0.2 kg
vt.% U = 85
enrichment U-233 = 88 wt. %

Separation Process: not available

Describe material at risk, which constitutes a source term.

Separated: Pre-1971

lization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: Y-12

1 container

primary container - tinplated steel

3 in diam. x 7-5/8 in. length

screw cap and plastic outer bagging based on recollections of person involved in packaging or receiving

secondary container - tinplated steel

3-3/4 in. diam. x 8 in. length

double seamed closure based on recollections of person involved in packaging or receiving

packaged by ORNL

Describe material at risk, which constitutes a source term.

Item Group: Y-12

Chemical Compound: U

Form: Discs

Total net quantity = 0.1 kg

wt.% U = 100 (inferred from descriptions)

enrichment U-233 = 97 wt.%

Separation Process: not available

Date Separated: Pre-1971

Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: ADU-SCRAP

1 container

primary container - stainless steel with screw top

3-3/8 in. diam x 3 in. length

plastic outer bagging

secondary container - tinplated steel

4-1/16 in. diam. x 7 in. length

double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.

Item group: ADU-SCRAP

nical Compound: Ammonium Diuranate

.: Powder

Total net quantity = 0.1 kg

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Bu[illegible]ing 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

·ribe material at risk, which constitutes a source term.

ʋt.% U = 70 (inferred from descriptions)
Avg. enrichment U-233 = 90 wt. %

Separation Process: Ion Exchange
Separation Date: 1987 (prevailing condition for materials in this group)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: ANL-10(ADU)
1 container

primary container - tinplated steel with screw top
3 in. diam x 7-3/4 in. length
plastic outer bagging

secondary container - tinplated steel
3-3/4 in. diam x 8 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.

group: ANL-10(ADU)
ical Compound: Ammonium Diuranate
Form: Powder

Total net quantity = 0.3 kg
Avg. wt.% U = 70 (inferred from descriptions)
Avg. enrichment U-233 = 98 wt.%

Separation Process: Ion Exchange
Separation Date: 1979 (prevailing condition for material in this group)
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: ARF-32
1 container

Primary container - stainless steel
dimensions not available
plastic outer bagging

Secondary container - inferred from descriptions
tinplated steel
4-1/16 in. diam
length not available
double seamed closure

packaged by Rocky Flats Plant

ged by Argonne National Laboratory East, Illinois

Describe material at risk, which constitutes a source term.
Item Group: CZA-90(CYL)
Chemical Compound: U
Form: Foil

Total net quantity = 0.02 kg
Avg. wt.% U = 100 (inferred from descriptions)
Avg. enrichment U-233 = 100 wt.%

Separation Process: not available
Separation Date: not available
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item group: HUA-2A
3 containers

primary container - Stainless steel with slip top
2-1/4 in. to 2.5 in diam. x 4 in. length
bagging information not available

secondary container - stainless steel
3.5 in. diam x 6.5 in. length
welded closure

packaged by Hanford Engineering Development Laboratory

Describe material at risk, which constitutes a source term.
Item Group: HUA-2A
Chemical Compound: Oxide
Form: Powder (based on recollections of involved personnel)

Total net quantity = 0.4 kg
Avg. wt% U = 81
Avg. enrichment U-233 = 97 wt.%

Separation Process: not available
Separation Date: not available
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).
Item group: HUA-2B
1 container

primary container - stainless steel with slip top
2-1/4 in. diam. x 4 in. length
bagging information not available

secondary container - stainless steel

3.5 in. diam. x 6.5 in. length
welded closure

packaged by Hanford Engineering Development Laboratory

Describe material at risk, which constitutes a source term.

Item Group: HUA-2B
Chemical Compound: Oxide
Form: Powder (based on recollections of involved personnel)

Total net quantity = 0.04 kg
Avg. wt% U = 87
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Separation Date: not available
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: KZA-8
1 container

primary container - steel based on recollections of person involved in packaging or storing
dimensions not available
plastic outer bagging

.dary container - tinplated steel
4 in. diam. x 12 in. length
double seamed

packaged by Knolls Atomic Power Laboratory

Describe material at risk, which constitutes a source term.

Item group: KZA-8
Chemical Compound: UO2
Form: Powder

Total net quantity = 0.2 kg
Avg. wt.% U = 86
Avg. enrichment U-233 = 96 wt.%

Separation Process: not available
Separation Date: not available
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: MM-4899
6 containers

ıry container - glass
screw top based on recollections of person involved in packaging or storing
plastic outer bagging

'ary container - tinplated steel
4-1/16 in. diam x 8 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: MM-4899
Chemical Compound: Oxide
Form: microspheres

Total net quantity = 0.2 kg
Average wt% U = 86
Average enrichment U-233 = 98 wt.%

Separation Process: Purex (based on recollections of involved personnel and descriptions)
Date Separated: 1976 (inferred from descriptions)
Stabilization Temperature = 1100 C

Describe packaging and its intended protective function(s).
Item group: OX-SCRAP
6 containers

y container - stainless steel with screw top
3-3/8 in. diam. x 3 in. length
plastic outer bagging

secondary container - tinplated steel
4-1/16 in. diam. x 7 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.
Item Group: OX-SCRAP
Chemical Compound: Oxide
Form: Powder

Total net quantity = 0.1 kg
Avg. wt.% = 83
Avg. enrichment U-233 = 90

Separation process: Ion Exchange
Date Separated: 1987
Stabilization Temperature = 800 C

⌐ ·ribe material at risk, which constitutes a source term.

microspheres

Total net quantity = 0.4 kg
Avg. U wt.% = 87
Avg. enrichment U-233 = 98 wt.%

Separation Process: Purex (based on recollections of involved pesonnel and descriptions)
Date Separated: 1976
Stabilization Temperature = 1100 C

Describe packaging and its intended protective function(s).

Item group: U/TH-SPH
3 containers

Primary container: based on recollections of person involved inpackaging or storing
glass
1.5 in. diam x 3 in. length
screw top closure
plastic outer bagging

Secondary container: tinplated steel
4-1/16 in. diam. x 7 in. length

ıged by ORNL

Describe material at risk, which constitutes a source term.

Item Group: U/TH-SPH
Chemical Compound: Oxide
Form: Microspheres

Total net quantity = 0.2 kg
Avg. wt.% U = 24
Avg. enrichment U-233 = 98 wt.%

Separation Process: Purex (based on recollections of involved personnel and descriptions)
Date Separated: 1973
Stabilization Temperature: 1100 C

Describe packaging and its intended protective function(s).

Item group: CEU
403 containers

primary container - 304L Stainless Steel
3.5 in. diam.
24-1/4 in. length
welded closure
no outer bagging

secondary container - Tinplate
3-9/16 in. diam.

24-3/4 in. length
double seamed closure

packaged by ORNL RDF

Describe material at risk, which constitutes a source term.
Item Group: CEU
Chemical Compound: U3O8
Form: Monolith

Total net quantity = 1675 kg
Avg. U wt. % = 62
Avg. enrichriment U-233 = 10 wt. %

Separation Process: Purex
Date Separated: 1968-1969
Stabilization Temperature = 700 C

Describe packaging and its intended protective function(s).
Item group: PZA-BPL
44 containers

Primary container - Stainless Steel
3-3/8 in. diam.
3-1/8 in. length
screw top - Buna-N rubber gasket
polythylene outer bagging

Secondary container - Tinplate
4-1/16 in. diam.
7 in. length
double seamed closure

packaged by ORNL RDF

Describe material at risk, which constitutes a source term.
Item Group: PZA-BPL
Chemical Compound: UO2
Form: Powder

Total net quantity = 18 kg
Avg. U wt. % = 87
Avg. enrichment U-233 = 98 wt. %

Separation Process: Modified Thorex & Ion Exchange
Date Separated: 1976
Stabilization Temperature = 450 C

Describe packaging and its intended protective function(s).

group: RDF-OX
..o containers

Primary container - Stainless Steel
3-3/8 in. diam.
3-1/8 or 7 in. length
Screw top - Buna-N rubber gasket
polyethylene outer bagging

Secondary container - Tinplate
4-1/16 in. diam.
7 to 8 in. length
double seamed closure

packaged by ORNL RDF

Describe material at risk, which constitutes a source term.

Item Group: RDF-OX
Chemical Compound: U3O8
Form: Powder

net quantity = 117 kg
. .g. wt. % U = 85
Avg. enrichment U-233 = 92 wt. %

Separation Process: Ion Exchange & Extraction Chromotography
Date Separated: 1980-1988
Stabilization Temperature = 800 C

Describe packaging and its intended protective function(s).

Item group: ARF-33
4 containers

Primary container - tinplated steel
dimensions not available
press-fit lid
plastic outer bagging

Secondary container - tinplated steel
dimensions not available
double seamed closure

..kaged by Rocky Flats Plant

Describe material at risk, which constitutes a source term.

Item Group: ARF-33

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE

Question 3: HEU Holdings and Packaging

Describe packaging and its intended protective function(s).

oup: SNM-9514

1 container

primary container - information not available

secondary container - tinplated steel
4-1/8 in. diam x 7 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.

Item Group: SNM-9514
Chemical Compound: U
Form: Chips

Total net quantity = 0.01 kg
Avg. wt.% U = 100 (inferred from descriptions)
Avg. enrichment U-233 = 100 wt.%

Separation process: not available
Separation date: Pre-1967
Stabilization Temperature: not available

Describe packaging and its intended protective function(s).

Item group: RCP-20
4 containers

primary container - tinplated steel with screw cap
3 in. diam. x 7-5/8 in. length
polythylene outer bagging

secondary container - tinplated steel
3-3/4 in. diam x 8 in. length
double seamed closure

packaged by ORNL

Describe material at risk, which constitutes a source term.

Item Group: RCP-20
Chemical Compound: U
Form: Pieces

Total net quantity = 4.6 kg
Avg. wt.% U = 93
Avg. enrichment U-233 = 98 wt.%

Separation Process: not available
Separation Date: Pre-1963 (inferred from descriptions)
Stabilization Temperature: not available

- -ribe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells

Question 4: POTENTIAL CAUSES

Facility

- Process Material Transfer
- [ ] Inadvertent Transfers
- [Y] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [Y] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [ ] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [ ] Inadequacy of Design Basis
- [ ] Design Deficiency
- Flooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [ ] Container Seal Degradation
- [Y] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [Y] Chemical Reactivity
- [Y] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydrolovsis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [ ] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperature
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transporation
- [ ] Adjacent Facility Accident
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells

Question 4: POTENTIAL CAUSES

Describe Each Potential Cause Identified Above:

ndition of some of the packaging is unknown. An inventory of the storage wells is planned beginning 1998 or 1999. Due to long p s of storage, it is anticipated that corrosion could affect the containment ability of the cans, causing a leak of powder in the storage wells. The corrosion could occur on the outside of the can due to the environment or on the inside of the can due to radiolysis. In the case of radiolysis, fluorine and/or other elements are generated due to radiation effects on the materials inside the can. The powder from a single bounding can is assumed to spill in the wells (unpressurized release). The release would occur below the shield plug which is placed in the well between the cans and the VOG system. The material is assumed to exit the 3039 stack via the VOG system. Such an event would be detected by the stack monitoring systems. Due to the slow processes connected with corrosion, it is not expected that more than one can would be involved in such an accident. It is assumed that a repackaging effort would ensue and that this would prevent further canister breaches.

Another scenario involves a can pressurizing and failing due to the generation of gases

Small amounts of moisture adsorbed on HEU may undergo radiolysis. However, the tendency of evolved hydrogen to diffuse to top of vertical storage wells allows the ventilation system to remove explosive concentrations of hydrogen.

Historically, the packages have shown no signs of deterioration.

Earthquakes of 0.12 g or greater may challenge the integrity of the hot cell storage areas. The concern is the collapse of the cell walls generating rubble which may breach the containers. The breached containers and falling debris could lead to an airborne powder release. However, the return period for a 0.12 g earthquake is 2000 years making this and unlikely event.

Fans in ducts may fail, although this will not have any direct impact since it will only mean air is stagnated in the VOG system.

grity

Integrity

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: storage wells

Question 5: POTENTIAL EFFECTS

Describe Each Effect Identified Above:

U-233 is highly radioactive, repackaging of material and other corrective actions are difficult. Thus, degraded packaging could ·n allowing U-233 to leak out of the container spreading contamination.

SITE: C ge National Laboratory	FACILITY (Building or Location):Building 3019
	PARTITIONED AREA: storage wells

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	**Contamination**	**Exposure**	**Injury**	**Ground**	**Water**	**Air**	**Contamination**	**Exposure**	**Injury**
Release of Materials	Y	Y							

Explanation

Environmental and public consequences are not checked since material released from the storag. wells would first pass through roughing and HEPA filters before exiting out of the stack. This is expected to sufficiently eliminate the risk to the environment and public.

Worker injury is not a consequence since the material would be release within the storage well not in an area where workers would be present.

Applicable References

Basis for Interim Operation Building 3019 Complex - Radiochemical Development Facility (RDF), BIO/3019-CTD/SSE/R0, Approved by DOE June 1996.

Operational Safety Requirements for the Radiochemical Development Facility, Chemical Technology Division, OSR/3019-CTD/R1, 12/1/95.

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):** Building 3019
	PARTITIONED AREA: labs

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

F ı partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment.
U. ow for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality [1,2]	Administrative Barrier[3]
[Y] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[Y] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Monitoring
[Y] Filter	[Y] Bay, Cells, Magazines		[Y] Configuration Control
[ ] Vault	[ ] Canyons		[Y] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[Y] Hood	[ ] Trenches		[Y] Training
[Y] Piping	[ ] Storage Vault		[Y] Organization
[Y] Shielding	[Y] Fire Suppression		[Y] Lessons-Learned
[Y] Distance	[Y] Alarm System		[Y] Testing
[Y] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[Y] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
onfinement System			[Y] External Regulation
urial Ground			[ ] Surveillance
[ ] Tanks			[Y] Personnel Reliability Assurance Program
[Y] Alarm System			[Y] Worker/Access Occupancy Limits
[Y] Temporary Barriers			[Y] Emgergency Response
[N] Other-specify			[ ] Other-specify
[ ] None			

1. rs between HEU and worker.
2. s between HEU and public/environment.
3. ...udes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 2: BARRIER TYPES

[ ]e each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Gloveboxes, hoods, ducts, rooms, confinement system components, piping, and transfer system protect workers from contamination while working with U-233.

Shielding, temporary barriers and distance protect worker from radiation hazards

Protective clothing - Personnel handling packaged U-233 wear protective clothing appropriate to the contamination hazard. Small amounts of U-233 (e.g. samples) of high purity (i.e. low U-232 content) packaged in multiple layers of metal containment with a smear- and alpha-probe-clean outer surface can be safely handled without protective clothing.

When external contamination is present and radiation levels allow, contamination area clothing, gloves, masks with HEPA filters, etc. might be required as defined by radiation work permit.

Alarm Systems - Area and personnel monitors and alarms are located in the lab areas to alert personnel to elevated levels of radiation and airborne contamination.

Public/Environment Barrier Narrative:

Facility/Building Boundary & HVAC/Confinement

The duct, room, and confinement system components which protect the worker also serve to protect the public and environment. See appropriate descriptions under storage well partition.

Fire Suppression

. anently installed, automatically actuated fire suppression system protects the building boundary from catastrophic fire damage.

The RDF is connected to the ORNL fire-protection water system at the fire equipment room (Room 21) on the south side of the building (near the building's southwest corner). Control valves and volume-limiting timers are located at this point. Most of the building is protected by a conventional automatic wet-type sprinkler system. Exceptions to this general plan are Cells 3, 5, 6, and 7, and the Building 3100 Vault which are protected by a dry pipe system. The dry pipe sprinkler system is used where a potential exists for water freezing in outside pipe runs. For most of these systems, the water supply is held back by valves automatically-actuated by heat detectors.

The wet pipe system is equipped with sprinkler heads that will open to allow water spray until the water header supply is manually cut off. Also located in these sprinkler headers are flow switches that will send an alarm to the Fire Department in the event that a sprinkler head opens and allows water to flow through the header. The wet pipe system is served by Risers #1 and #2 located in the fire equipment room (Room 21).

The fire zone identification system is located at the Emergency Control Center (ECC) on the north side of Building 3019 outside Room 121. The system consists of a series of lights numbered from 1 to 24. These lights (and the building's audible fire alarms) are actuated either by a flow switch located in the sprinkler header or by a heat detector. A sign describing the location and type of sprinkler system for each zone is posted near the zone lights. The sign also describes other special provisions that may be incorporated in the equipment for each zone (e.g., automatic timed cut-off valves).

The RDF is served by master fire alarm boxes and auxiliary fire boxes. When a master fire box is actuated (either directly or indirectly by a signal from one of the auxiliary boxes), an alarm is automatically transmitted to the Fire Department indicating the master box number, the appropriate fire zone identification light is activated, and the building's audible alarm is sounded.

Alarm System

[ ]a monitors are located around the ORNL site and monitor air emissions.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 2: BARRIER TYPES

Describe each barrier identified above and its intended protective functions.

C ...lity Barrier Narrative:

NCS is maintained by a combination of mass, geometry, and concentration controls.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures. All personnel are trained to current procedures.

Authorization basis is current and approved. Revised basis is in approval process.

Material limits are in effect to prevent criticality.

Worker access is controlled.

Records are maintained and safety systems are tested on a predetermined schedule.

Routine programs for monitoring and surveillance are in place.

Organization is defined, and a lessons-learned program has been implemented.

Applicable conduct of operations is in place.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: labs

Question 3: HEU Holdings and Packaging

ial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Compounds	U-233<10 ppm	Other	G1, B2, D3	Process Area	~8 years	6	0.0560
Sources and Samples	U-233<10 ppm	Other	V6, B1, W2	Process Area	~8 years	1	0.0010
Oxides	U-233<10 ppm	Pure oxides	C0, B1, D3	Process Area	~8 years	1	0.0001
Metal	U-233<10 ppm	Alloys	C0, B1, D2	Process Area	~8 years	1	0.0002
Oxides	U-233<10 ppm	Pure oxides	C0, B1, D2	Process Area	~8 years	1	0.0010
Oxides	U-233<10 ppm	Pure oxides	C0, B1, D2	Process Area	~8 years	1	0.0070
Sources and Samples	U-233>10 ppm	Other	U0, D3	Process Area	~8 years	1	0.0780
Compounds	U-233>10 ppm	Uranium Hexafluoride	V6, B1, W2	Process Area	~8 years	1	0.0002
Oxides	U-233<10 ppm	Pure oxides	U0, C3	Process Area	~8 years	1	0.0030
Oxides	U-233<10 ppm	Pure oxides	U0, C0	Process Area	~8 years	1	0.0030
Oxides	U-233<10 ppm	Pure oxides	U0, C0	Process Area	~8 years	1	0.0001
C	U-233<10 ppm	Pure oxides	C0, B1, D3	Process Area	~8 years	1	0.0004

9 3019
No. of Packages
1

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item Group: MSRESAMP
UF6
In gas cylinder

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: OX-343
oxide products

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: SNM-103
oxides product

Describe packaging and its intended protective function(s).

be material at risk, which constitutes a source term.
group: SNM-104
dioxides product
Room 110

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: SNM-4032
dioxides product

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: SNM-9514
unalloyed castings

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
roup: SR1M
yed castings
total wt. U = 0.003 kg
room 110

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

D -ibe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: SR2R
oxide and dioxide products
Room 110

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item Group: Th-232-41
Thorium
unradiated process residue

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item group: U233-058
samples and standards

Describe packaging and its intended protective function(s).

L .ibe material at risk, which constitutes a source term.
Item group: U233-1
oxide product
can

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item groups: U23FC001, U23FC002
experimental, capsules, elements and pins

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Item Group: U33CT1
oxide product
Room 110

Describe packaging and its intended protective function(s).

ibe material at risk, which constitutes a source term.
group: X112143
samples and standards

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 3019

PARTITIONED AREA: labs

Question 4: POTENTIAL CAUSES

Facility

- [ ] Process Material Transfer
- [ ] Inadvertent Transfers
- [Y] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [Y] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [ ] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- [ ] Design Deficiency
- [ ] Flooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [Y] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [Y] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydrolysis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperature
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transportation
- [ ] Adjacent Facility
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 4: POTENTIAL CAUSES

Γ ·ibe Each Potential Cause Identified Above:

. equipment failure, or corrosion may cause material release.

Small amounts of moisture may undergo radiolysis causing container degradation.

Design basis of the building and chimney stack structure are unknown. The seismic and wind capacity of the building and chimney stack have not been evaluated to the current DOE standard DOE-STD-1020-94. The soil has not been characterized per current DOE standards, so subsidence is a possibility.

Design basis of the HEPA filter equipment is unknown. The seismic and wind capacity of the equipment has not been evaluated to the current DOE standard DOE-STD-1020-94. The ventilation duct lines going from building to HEPA filters bunkers and then to chimney stack are exposed to high winds and missiles.

The seismic and high wind capacity of the support system and functionality of the neutron detectors during or after seismic and high wind event has not been determined.

Fans in ducts may fail, although this will not have any direct impact since it will only mean air is stagnated in the VOG system.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[ ] Loss of Building Integ
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Critical
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 5: POTENTIAL EFFECTS

ibe Each Effect Identified Above:

.itial causes could lead to material release. Contamination could occur within the facility exposing workers.

In a seismic or high wind event the building, chimney stack, equipment for HEPA filters, and the ventilation lines can fail. Also, the ventilation duct lines going from building to HEPA filters bunkers and the to stack are exposed to high winds or missiles and can fail in such events.

SITE: Oak F National Laboratory	FAC LITY (Building or Location): Building 3019
	PARTITIONED AREA: labs

Question 6: POTENTIAL CONSEQUENCES

Effect	Worker			Environment			Public		
	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Release of Materials	Y	Y	Y						

Explanation

The small amount of material present in the lab means any effects will be negligible.

Applicable References

Basis for Interim Operation Building 3019 Complex - Radiochemical Development Facility (RDF), BIO/3019 CTD/SSL/R0. Approved by DOE June 1996.

Operational Safety Requirements for the Radiochemical Development Facility, Chemical Technology Division, OSR/3019-CTD/R1, 12/1/95.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: residual areas

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

F ·ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. .ow for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[Y] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify)	[Y] Material Limts
[Y] Duct	[ ] Liquid Containment/Dike	(e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Monitoring
[Y] Filter	[Y] Bay, Cells, Magazines		[Y] Configuration Control
[ ] Vault	[ ] Canyons		[Y] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[Y] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[Y] Piping	[ ] Storage Vault		[Y] Organization
[Y] Shielding	[Y] Fire Suppression		[Y] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[Y] Confinement System			[Y] External Regulation
ʒurial Ground			[Y] Surveillance
[Y] Tanks			[Y] Personnel Reliability Assurance Program
[ ] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

1. Barriers between HEU and worker.
·iers between HEU and public/environment.
ɹdes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: residual areas

Question 2: BARRIER TYPES

r ɔe each barrier identified above and its intended protective functions.

~~Site area monitors are located around the ORNL site and monitor air emissions.~~

Criticality Barrier Narrative:

NCS is maintained by a combination of mass, geometry, and concentration controls.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures. All personnel are trained to current procedures.

Authorization basis is current and approved.

Material limits are in effect to prevent criticality.

Worker access is controlled.

Records are maintained and safety systems are tested on a predetermined schedule.

Routine programs for monitoring and surveillance are in place.

Organization is defined, and a lessons-learned program has been implemented.

Applicable conduct of operations is in place.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	PARTITIONED AREA: residual areas

Question 3: HEU Holdings and Packaging

ial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages
Process residues	U-233<10 ppm	Other	in equipment	Process Area In equipment in basement	~20 years	8
Process residues	U-233<10 ppm	Other	in equipment	Other-specify In equipment in pipe tunnel	~25 years	3
Process residues	U-233<10 ppm	Other	in equipment	Process Area In equipment in cells	~8 years	4
Solutions	U-233<10 ppm	Nitric acid	T1	Other-specify P-24 tank	~8 years	1
Sources and Samples	Very Highly	Sealed Sources	stainless steel	Other-specify P-3 tank	< 1 year	1

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	FUNCTION: URANIUM-233 STORAGE
Question 3: HEU Holdings and Packaging	

D---ribe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Item groups: BOXRESIDUE, FUR-RESDU
In basement equipment
Total U wt. = 0.092 kg

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Item group: ANL/BAPL
In equipment in pipe tunnel
Total U wt. = 0.08 kg

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Item group: RCP-01
In equipment in cells
Total U wt. = 0.104 kg

-ibe packaging and its intended protective function(s).

,P-24
Raschig Ring filled

Describe material at risk, which constitutes a source term.

Item group: RCP-01
Total U wt. = 0.130 kg
nitrate solutions product in P-24 tank

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Item group: FZE-6A
samples and standards in cells
Total U wt. = 0.081 kg

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ITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 3019

PARTITIONED AREA: residual areas

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] [illegible]cess Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[Y] Container Seal Degradation	[Y] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[ ] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[Y] Corrosion/Embrittlement	[Y] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydrolovsis	[ ] Onsite Transportation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[ ] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
[ ] [illegible]ooding		
[ ] [illegible]re		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: residual areas

Question 4: POTENTIAL CAUSES

	Facility		Material		External
	Process Material Transfer		Aging		Fire
	Inadvertent Transfers	Y	Container Seal Degradation	Y	Explosion
Y	Aging/Degradation		Pressurization	Y	Earthquakes
Y	Equipment Failure		Pyrophoricity	Y	Subsidence
	Change in Mission		Radioactivity	Y	Winds
	Other Collocated Hazards		Chemical Reactivity		Floods
Y	Corrosion/Embrittlement	Y	Radiolysis		Extreme Temperature
	Inadequate Configuration Knowledge		Volumetric Expansion		Snow
	Combustible Loading		Oxidation		Ash Loading
	Inadequate Seals		Flammability		Aircraft Crash
	Water Sources		Toxicity		Vehicle Accident
	Inadequate Drains		Hydroloysis		Onsite Transporation
	Preventive Maintenance Failure		Crystallization		Adjacent Facility Accident
	Administrative Control		Other - Specify		Other-specify
	Human Error				
	Chemical Reactions				
	Contamination				
Y	Inadequacy of Design Basis				
	Design Deficiency				
	ooding				
	Fire				
	Other SAR Accidents				
	Other-specify				

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Buildg 3019
	PARTITIONED AREA: residual areas

Question 4: POTENTIAL CAUSES

...ibe Each Potential Cause Identified Above:

...of the facility, equipment failure, corrosion, container seal degradation, or wind damage to external ventilatio system comp... could lead to material release.

Small amounts of moisture may undergo radiolysis. However, all equipment and contaminated areas are ventilate in a manner ... prevents accumulation of explosive concentrations of hydrogen.

Tank P-24 is not seismically qualified to current standards. The soil around the tank needs characterization before proper ... analysis can be performed. Therefore, an earthquake could damage piping attached to the tank, causing loss of ta contents, ... damage the bunker in which the tank is located.

The tanks may undergo subsidence since they are not built down to the bedrock.

Fans in ducts may fail, although this will not have any direct impact since it will only mean air is stagnated in the VC system.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: residual areas

Question 5: POTENTIAL EFFECTS

Facility	Material	External
ire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[ ] Loss of Building Integrity
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory

ribe Each Potential Cause Identified Ab

of the facility, equipment failure, corrosion, could lead to material release.

Small amounts of moisture may undergo radiol prevents accumulation of explosive concentrati

Tank P-24 is not seismically qualified to curren analysis can be performed. Therefore, an ea damage the bunker in which the tank is locate

The tanks may undergo subsidence since th

Fans in ducts may fail, although this will not

SITE: Oak ne National Laboratory

FACILITY (Building or Location):Building 3019

PARTITIONED AREA: residual areas

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Release of Materials	Y	Y		Y	Y		Y	Y	

Explanation

Worker injury is not a consequence since the spill is assumed to take place during an unattended transfer.

Public injury is not a consequence since the spill takes place on site and public exposure only occurs after going through an environmental pathway.

Air contamination is not a consequence since we are dealing with a spill, not an airborne release.

Applicable References

Basis for Interim Operation Building 3019 Complex - Radiochemical Development Facility (RDF), BIO/3019-CTD/SSE/R0, Approved by DOE June 1996.

Operational Safety Requirements for the Radiochemical Development Facility, Chemical Technology Division, OSR/3019-CTD/R1, 12/1/95.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3019
	PARTITIONED AREA: residual areas

Question 5: POTENTIAL EFFECTS

Describe Each Effect Identified Above:

In [illegible] nlikely event of an earthquake or unattended transfer of material, loss of stored liquid from the P-24 tank would result in a [illegible] e public and worker consequence.

In a seismic or high wind event the bunker and elements of the VOG system may fail. Also, the ventilation duct lines are exposed to high winds or missiles and can fail in such events.

SITE: Oak ~~e National Laboratory	FACILITY (Building or Location):Building 3019
	PARTITIONED AREA: residual areas

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Release of Materials	Y	Y		Y	Y		Y	Y	

Explanation

Worker injury is not a consequence since the spill is assumed to take place during an unattended transfer.

Public injury is not a consequence since the spill takes place on site and public exposure only occurs after going through an environmental pathway.

Air contamination is not a consequence since we are dealing with a spill, not an airborne release.

Applicable References

Basis for Interim Operation Building 3019 Complex - Radiochemical Development Facility (RDF), BIO/3019-CTD/SSE/R0, Approved by DOE June 1996.

Operational Safety Requirements for the Radiochemical Development Facility, Chemical Technology Division, OSR/3019-CTD/R1, 12/1/95.

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vents

ed conta

[illegible]

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3027
	FUNCTION: SNM Storage Vault
Question 1: SITE	

Headquarters Facility Landlord: ER

. Headquarters Program Sponsor: ER, NE **Design Life:** 0

Facility Age: 17

Location of Facility on Site and Distance to Site Boundary

The 3027 vault is located within the confined principal boundaries of the Oak Ridge National Laboratory (ORNL). It is situated near the northwest corner of the intersection of Fifth Avenue and Hillside Avenue (Fig 2). From the vault centerpoint, it is approximately 770 feet north to the perimeter fence, and approximately 810 feet to Bethel Valley Road, a public highway through the DOE Oak Ridge Reservation. The closest point to ORNL's perimeter fence is to the NNE at a distence of approximately 650 feet. To the NNW, at approximately 330 feet is building 3001. At the NE corner of this building is the public access to the Graphite Reactor, a national landmark.

Design Mission, Interim Mission, Current Use

The design mission of building 3027 was a Security Category 1 vault. It was never utilized as such, and is currently Security Category III. The building was specifically designed and constructed for the receipt of nuclear materials. No materials processing is performed. At all times material of each holding in the vault remains packaged within at least two barriers. Fissionable mateial containers may be opened in the vault provided the material itself remains at least doubly contained.

Building 3027 is a one story structure 63 feet wide and 54 feet long. The facility consists of an entry air-Lock (101), a Receiving Room (102), five storage rooms (103,104,105,107, and 108) and a mechanical equipment room (106), for electrical and ventilation equipment. The equipment Room is basicaly isolated from the seven rooms which make up the operating area. All nuclear materials are received in closed, sealed containers and are stored in the storage rooms.

The building construction was completed in 1980 with the completion and approval of the "as-buiilt" drawings. The building is constructedof reinforced concrete 18 inches thick, with a 10-inch reinforced concrete roof. The building sits on an 18 inch concrete slab which is integral with the exterior walls. The building was designed and constructed to withstand both a 0.15g earthquake and a 350 mph wind. The layout of the building and the location of equipment representative of the containment ·ier is shown in Figure 1.

ıinor mission change occurred in September 1989, when the storage of precious metals within the vault was allowed. However, the decision was later made to no longer store precious metals in the vault. All precious metals have been removed.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3027
	FUNCTION: SNM Storage Vault

Question 1: SITE

:rational Status

operating

Historical Information

Occurrence Reports are:

ORO-MMES-X10PLEQUI-1993-0009, 06/16/93, Failure to follow Naional Electrical Code

ORO-MMES-X10LABPROT-1994-0001, 12/16/94, Unsatisfactory Surveillance/Inspectioin Findings

ORO-MMES-X10LABPROT-1994-0002, 01/25/95. Self-Assessment of limiting conditions document resulting in violations of procedures and testing

Other Regulatory Concerns: None Identified

DNFSB Concerns: 94-1 Implementation Plan

List Authorization Basis

Basis of Interim Operations (BIO) approved (1996)

Describe Important or Unique Design Features

Describe Weaknesses in the Design Basis

Structural Design

Concrete/slab

.itioned Areas of HEU within facility

Room 107

Description of Partitioned Areas

Room 107 of the vault stores all HEU in the vault.

Natural depleted or enriched uranium, and natural thorium are stored separately, away from the highly toxic alpha-emitters. R:: 107 inside the vault has been designated and clearly identified for the storage of these materials. Inside the vault, the nuclear material has been aggregated as follows:

- Room 103 contains no nuclear material
- Room 104 contains enriched 239/241Pu, 242Pu, 241Am, 243Am, and Np
- Room 105 contains 237Pu, 239/241Pu, and 242Pu
- Room 107 contains depleted U, enriched 235U, 238U, and thorium
- Room 108 contains no nuclear material

See Figure 3 for location of barriers

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 3027
	FUNCTION:	SNM Storage Vault

Question 1: SITE

ount & Location of Hazardous Material Collocated or Commingled with HEU

ı horium	4 grams
Depleted U	140 grams

Process Material Transfers

Building 3027 is not a processing facility/area. Before acceptance into the vault, each closed and sealed container is surveyed and tagged by Health Physics. No container with surface contaminatiin above accepted limits is allowed.

On-Site Transportation

Uranium containers are moved by dolly or by hand within the facility.

Staff Levels & Experience

	Number of Employees	Average Bldg Experience	Range
Supervisor	3	7	3-9

Applicable References

BIO: IP/3027/F/7-93/R1 (1996)

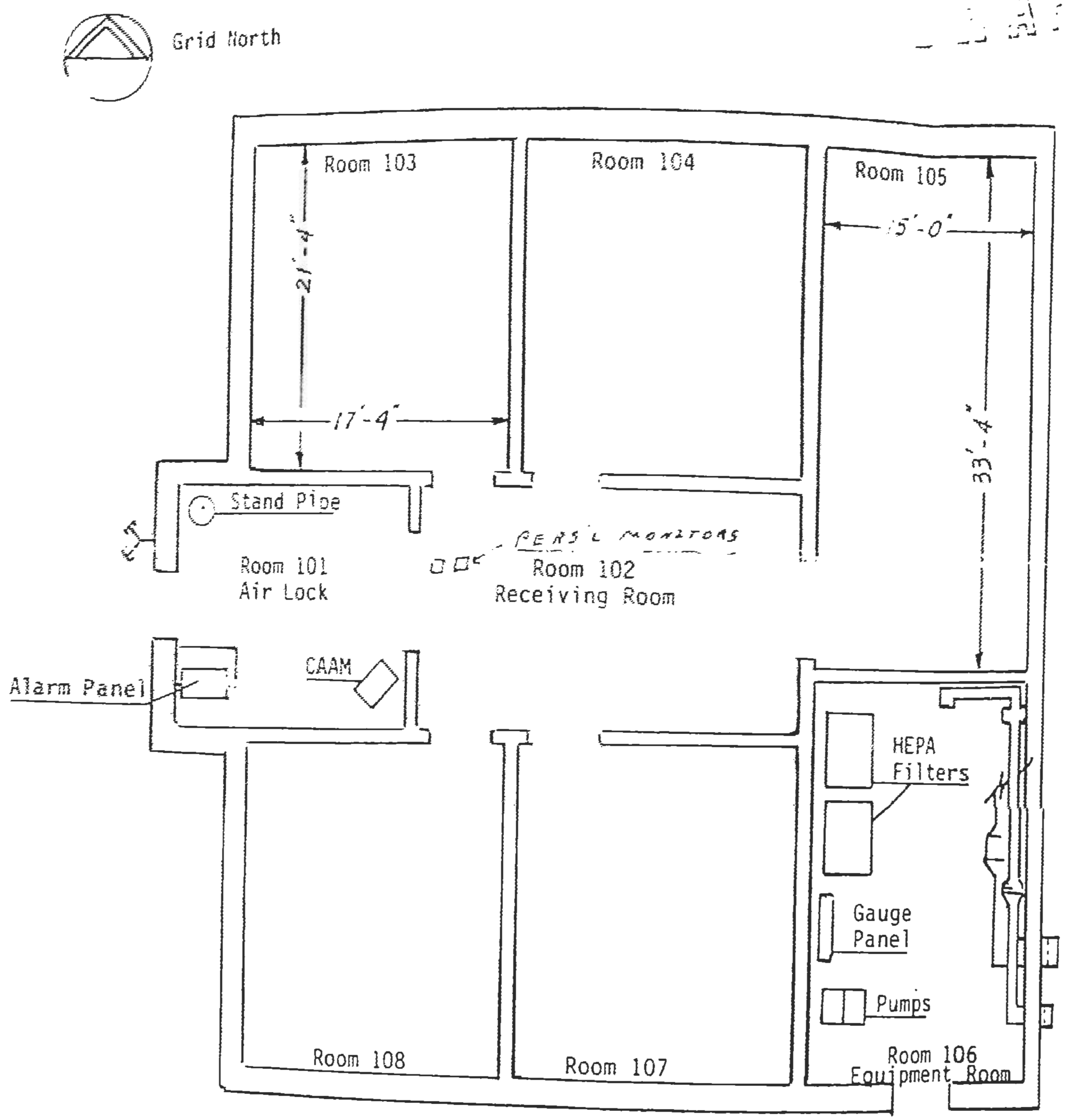


Figure 1. Building 3027 Layout

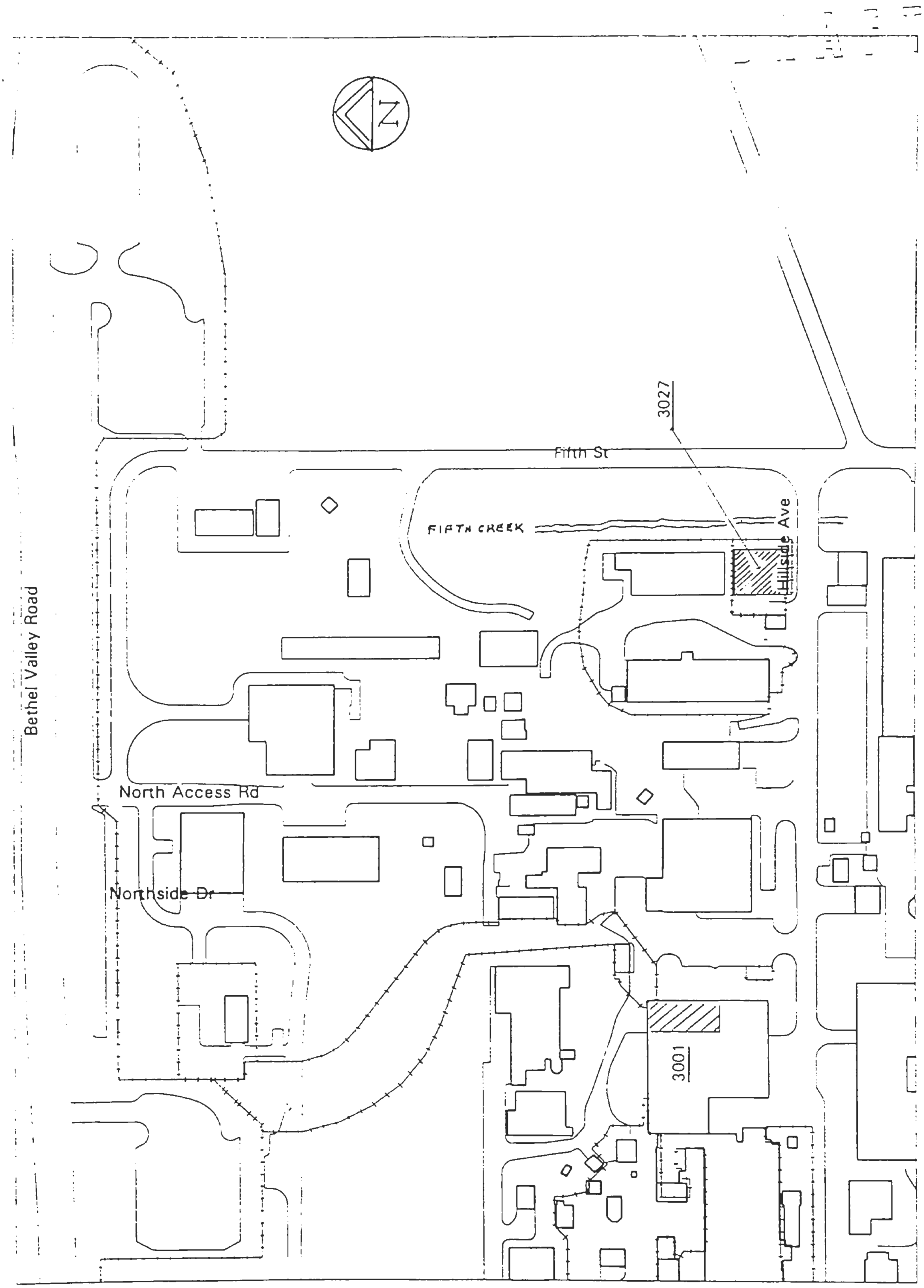


Figure 2. Building 3027 Location

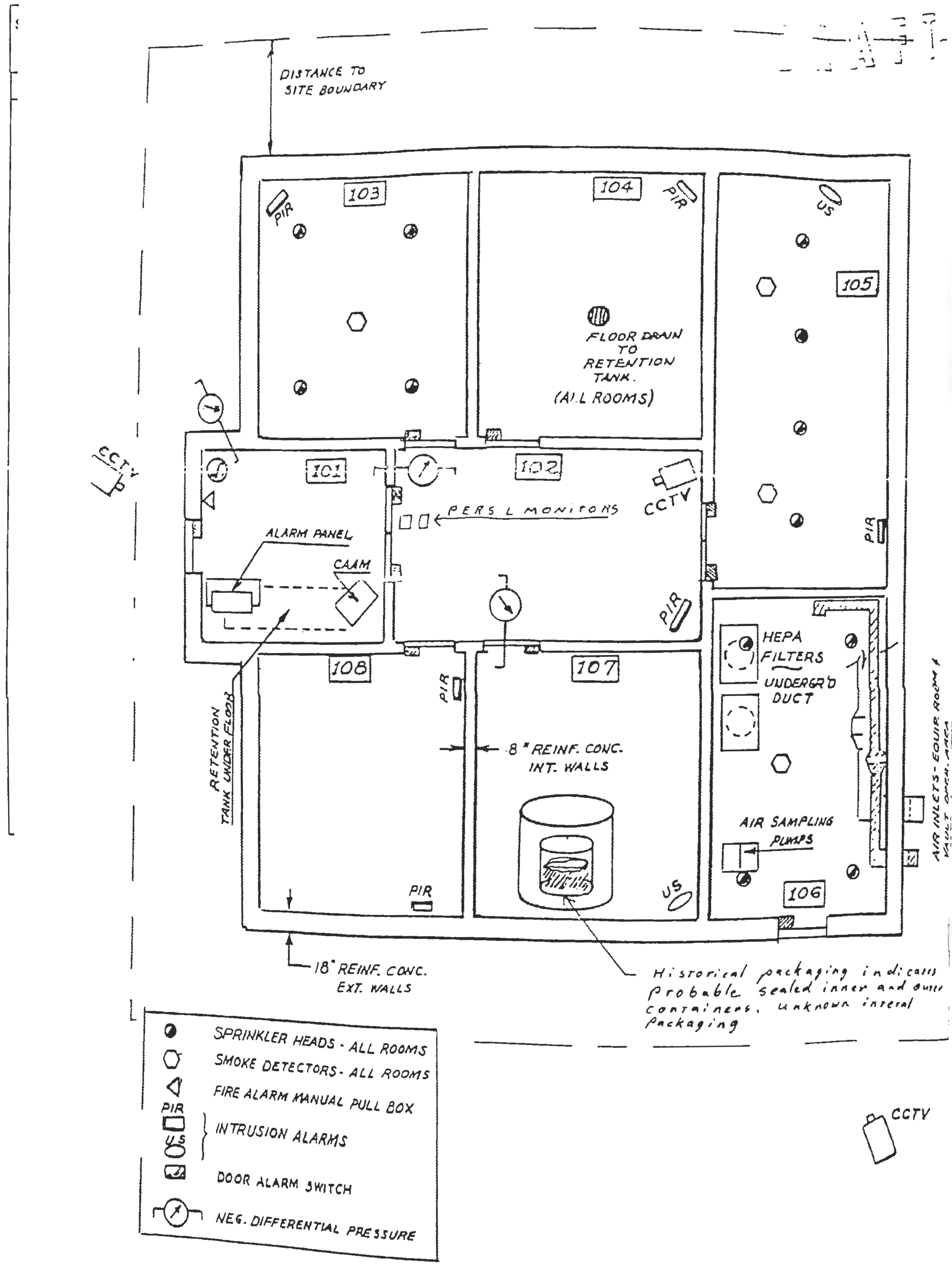


FIGURE 3. 3027 VAULT BARRIERS

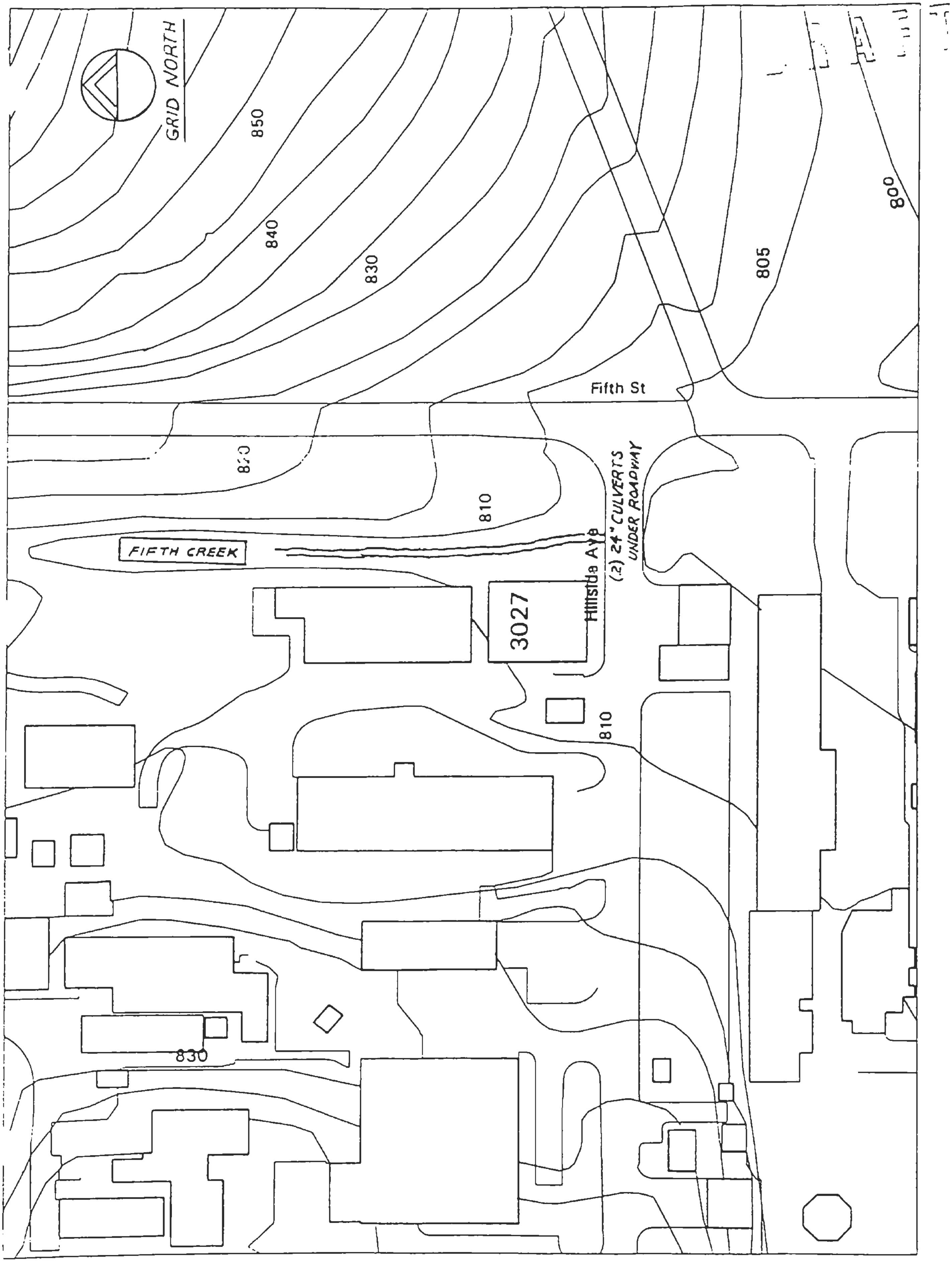


Figure 4. Area Topography

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3027
	PARTITIONED AREA: Room 107

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike		[Y] Monitoring
[ ] Filter	[Y] Bay, Cells, Magazines		[ ] Configuration Control
[Y] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[Y] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[ ] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[ ] Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[Y] Alarm System			[ ] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[ ] Emergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

iers between HEU and worker.
iers between HEU and public/environment.
3. includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

ɛrial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Other Unknown	U0, C0	Vault	<20	3	0.0350

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control

Describe material at risk, which constitutes a source term.

S

SITE: Oak Ridge National Laboratory				FACILITY (Building or Location)			
				PARTITIONED AREA: Room 107			
Question 3: HEU Holdings and Packaging							
...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Other Unknown	U0, Ring fasten lid	Vault	<20	5	[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 5 gallon can with ring fastened lid

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging							
erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other	U0, C0	Vault	<20	3	0.0080

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control

Describe material at risk, which constitutes a source term.

SI

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

ərial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mas (kg)
Oxides	Enriched	Other Unknown	U0, Ring fasten lid	Vault	<20	5	0.0

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 5 gallon can with ring fastened lid

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	U0, Bolted ring lid	Vault	<20	2	0.0220

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment: temporary storage; contamination control; 5 gallon can with bolted ring lid

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Other Unknown	U0. C0	Vault	<20	4	0[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment: temporary storage; contamination control

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

ɜrial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	U0, Bolted ring lid	Vault	<20	2	0.0220

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 5 gallon can with bolted ring lid

Describe material at risk, which constitutes a source term.

S

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Ma (kg
Sources and Samples	Very Highly	Other	U0, Ring fasten lid	Vault	<20	2	[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 5 gallon can with ring fastened lid

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging							
erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other	U0, D1	Vault	<20	1	0.0090

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 55 gallon drum with ring fastened lid

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

.erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Other Unknown	X2, 6M 10 gallon	Vault	<20	1	0.02[illegible]

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 10 gallon "6M" container

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codess which indicates "Dioxides Product"

SITE: Oak Ridge National Laboratory				FACILITY (Building or Location)			
				PARTITIONED AREA:	Room 107		
Question 3: HEU Holdings and Packaging							
...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Compounds	Weapons	Other	U0, Bolted ring lid	Vault	<20	1	0.0620

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 5 gallon can with bolted ring lid

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codes which indicates "Tetrafluoride Product"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

...rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Ma... (kg)
Metal	Very Highly	Impure	U0. C0	Vault	<20	2	[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codes which indicates "Billets Product" and "In fuel element and target Fab Process"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

..rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Unknown	U0, D1	Vault	<20	1	0.0720

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 55 gallon Drum with bolted lid

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Ares record codes whih indicates "Dioxides Product"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

:rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Unknown	U0, Can press fit l	Vault	<20	1	0.(

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective functior.(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 1 gallon "Paint " can with press fit lid

Describe material at risk, which constitutes a source term.

Material desciptin based on Material Balance Area record codes which indicates "Miscellaneous Compounds"

Material mass = <0.000045 kg

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

..rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Weapons	Alloys	U0, Bolted ring lid	Vault	<20	1	0.0540

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-site shipment; temporary storage,contamination control; 5 gallon can with bolted ring fastened lid

Describe material at risk, which constitutes a source term.

Material description based on Material Balance area record codes which indicates "Billets Products"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Impure	U0, C2	Vault	<20	5	0.0

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control

Describe material at risk, which constitutes a source term.

Material descrptiion based on Material Balance Area record codes which indicate "Experimental capsules, elements. pins"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

...rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Weapons	Alloys	U0, D1	Vault	<20	1	0.0120

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment; temporary storage; contamination control; 55 gallon with Bolted Ring Fastened Lid

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codes which indicates "Billets Products"

06/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

:rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Weapons	Unknown	U0, C0, W1	Vault	<20	7	0.1[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-siste shipment: temporary storage; contamination control

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codes which indicates "Billets Products" and "Fabricated Fuel Elements and Target Fab. Process"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Room 107

Question 3: HEU Holdings and Packaging

:rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Impure Unknown . Possibly	U0, C0	Vault	<20	1	0.0030

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Unknown internal packaging; Historical on-site shipment, temporary storage, contamination control

Describe material at risk, which constitutes a source term.

Material description based on Material Balance Area record codes which indicates "Fabrication Fuel Elements and targets Procucts"

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3027
	PARTITIONED AREA: Room 107

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[Y] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[ ] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[Y] Other - Specify	[ ] Other-specify
[Y] Human Error	Packaging configuration unknown	
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3027
	PARTITIONED AREA: Room 107

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[Y] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[Y] Loss of Building Integ
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Critical
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3027
	PARTITIONED AREA: Room 107

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

. _cility:
Worker exposure to contaminatioin is extremely unlikely, because of administrative controls. The general plant population would not be exposed, but vault workers might. One scenario would be placing an already contaminated storage container in the vault. The second scenario requires a deliberate or malevolent act in breaching a sealed container inside the vault.

Contamination of the facility could occur, based on the two scenarios described abocve. During a seismic event, storage racks and cabinets may tip over, unlatched drawers in file cabinets slide open, rim sealed stainless steel containers are damaged and leak. Larger storage containers may also topple during a seismic event.

Human error in the placement of storage containers could occur.

Material:
Criticality can occur only if nuclear material is removed from both inner and outer containers. Such an occurrence would require a deliberate act.

Fissile matrerial release would require the breaching of both inner and outer containers of a storage package. The resulting contamination will be confined to the interior of the vault.

Breach of containers, other than as a delibrate act, is not a likely event. Containers are routinely inspected for exterior signs of degradation.

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 3027 PARTITIONED AREA: Room 107
Question 6: POTENTIAL CONSEQUENCES	

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Material)									

Explanation

No vulnerability to the worker, public or environment since any release would be contained within the facility. Worker access to this facility is restricted to weekly inspection of packaging but the facility is monitored by a Health Technican before entry by workers.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability)

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3036
	FUNCTION: RAMSPAC
Question 1: SITE	

Headquarters Facility Landlord:
Headquarters Program Sponsor:
Design Life: 0
Facility Age: 0

Location of Facility on Site and Distance to Site Boundary

Building 3036 is located in the northwest corner of the intersection of central Avenue and Fifth Street. It adjacent to Building 3047 to the north and Buiding 3037 to the south.

Design Mission, Interim Mission, Current Use

The current mission of this facility is to prepare radioactive material for shipment to other DOE sites using DOT procedures for packaging and shipping. Containers of HEU are not opened for any reason when they are in the facility for packaging for shipping. The DOT package is forwarded to Building 7001A for pickup by the transportation carrier.

Operational Status

Operating

Historical Information

No Occurence reports against this facility as Radioactive Material Shipping and Packaging Facility (RAMSPAC).

Other Regulatory Concerns: None Identified
DNFSB Concerns : None Identified

List Authorization Basis

Describe Important or Unique Design Features

facility is protected by an automatic wet-pipe sprinkler system. The building fire alarm system sounds local evacuation horns initiates a fire alarm signal to the on-site ORNL Fire Department.

Describe Weaknesses in the Design Basis

Structural Design

Butler-type

Partitioned Areas of HEU within facility

3036

Description of Partitioned Areas

HEU is shipped to this facility for packaging for DOT shipments offsite. All HEU is stored in locked metal cabinet until tranported for shipment. HEU are not handled outside of their container packaging , no special ventilation, confinement or ventilation is required for the facility.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3036
	FUNCTION: RAMSPAC

Question 1: SITE

ount & Location of Hazardous Material Collocated or Commingled with HEU

Varied amount of material will be stored in this facility, but all hazardous material will be appropriately packaged when entering and leaving this facility.

Process Material Transfers

On-Site Transportation

Staff Levels & Experience

Applicable References

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):** Building 3036
	PARTITIONED AREA: 3036

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ıch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U… below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality [1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike		[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[ ] Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[Y] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

iers between HEU and worker.
riers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3036
	PARTITIONED AREA: 3036

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
						0	0.0000

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 3036

PARTITIONED AREA: 3036

Question 4: POTENTIAL CAUSES

Facility

- Process Material Transfer
- Inadvertent Transfers
- Aging/Degradation
- Equipment Failure
- Change in Mission
- Other Collocated Hazards
- Corrosion/Embrittlement
- Inadequate Configuration Knowledge
- Combustible Loading
- Inadequate Seals
- Water Sources
- Inadequate Drains
- Preventive Maintenance Failure
- Administrative Control
- Human Error
- Chemical Reactions
- Contamination
- Y Inadequacy of Design Basis
- Design Deficiency
- Flooding
- Fire
- Other SAR Accidents
- Other-specify

Material

- Aging
- Container Seal Degradation
- Pressurization
- Pyrophoricity
- Radioactivity
- Chemical Reactivity
- Radiolysis
- Volumetric Expansion
- Oxidation
- Flammability
- Toxicity
- Hydroloysis
- Crystallization
- Other - Specify

External

- Fire
- Explosion
- Y Earthquakes
- Y Subsidence
- Y Winds
- Floods
- Extreme Temperature
- Snow
- Ash Loading
- Aircraft Crash
- Vehicle Accident
- Onsite Transporation
- Adjacent Facility Acc
- Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3036
	PARTITIONED AREA: 3036

Question 4: POTENTIAL CAUSES

·ribe Each Potential Cause Identified Above:

‸equacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown , seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94

Earthquakes, subsidence, wind - Design basis of the building structure is unknown , seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3036
	PARTITIONED AREA: 3036

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[ ] Loss of Buil'ng Integrity
[ ] Contamination	[ ] Breach of Packaging	[ ] Release of terials
[ ] Criticality	[ ] Fire	[ ] Radiation a . Releases fr..n Criticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-sperify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3036
	PARTITIONED AREA: 3036

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

... a seismic or high wind event the building can collapse. The material will be packaged and in a storage cabinet. The packages wil be double packaged awaiting to be put into a DOT transportation container or already in a DOT container.

SITE: Oak National Laboratory	FACILITY (Building or Location): Building 3036
	PARTITIONED AREA: 3036

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

Vulnerability does not exist for this facility; no HEU has been in this facility for packaging.
No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3500
	FUNCTION: I & C Research and Offices

Question 1: SITE

Headquarters Facility Landlord:

Headquarters Program Sponsor:

Design Life: 0

Facility Age: 0

Location of Facility on Site and Distance to Site Boundary

Building 3500 is located on a flat area bounded by Central Avenue on the North, White Avenue on the south, Fifth Street on the east, and Fourth Street on the west. This building is in the northeast section of the parcel of the ORNL major boundary. The building is on the southwest corner of the intersection of Fifth Street and Central Avenue. It is located approximately 300 feet from the southern boundary. (see Fig 1)

Design Mission, Interim Mission, Current Use

The building was constructed in 1950 with an annex added in 1960. The annex was to accomodate the basic Research and Development staff, reactor controls, and instrument development groups. The building currently provides office, staff, shop and laboratory space for Instrument and Control Division.

Operational Status

Operating

Historical Information

Occurrence Reports are:

ORO-MMES-X10LABPROT-1991-1021, 11/20/91, Evacuation caused by Fire Alarm

ORO-MMES-X10WSTEMRA-1993-0006, 08/13/93, Leak in Transfer Line

ORO-MMES-X10WSTEMRA-1993-0008, 09/03/93, Personnel Contamination Sampling WC-10

ORO-MMES-X10WSTEMRA-1993-0011, 02/14/94, Osr Violation of permissible volume tank level exceeded 100% OSR Limit

ORO-MMES-X10WSTEMRA-1994-0007, 06/06/94, Near miss on WC-9's tank level

Other Regulatory Concerns: None Identified

DNFSB Concerns: None Identified

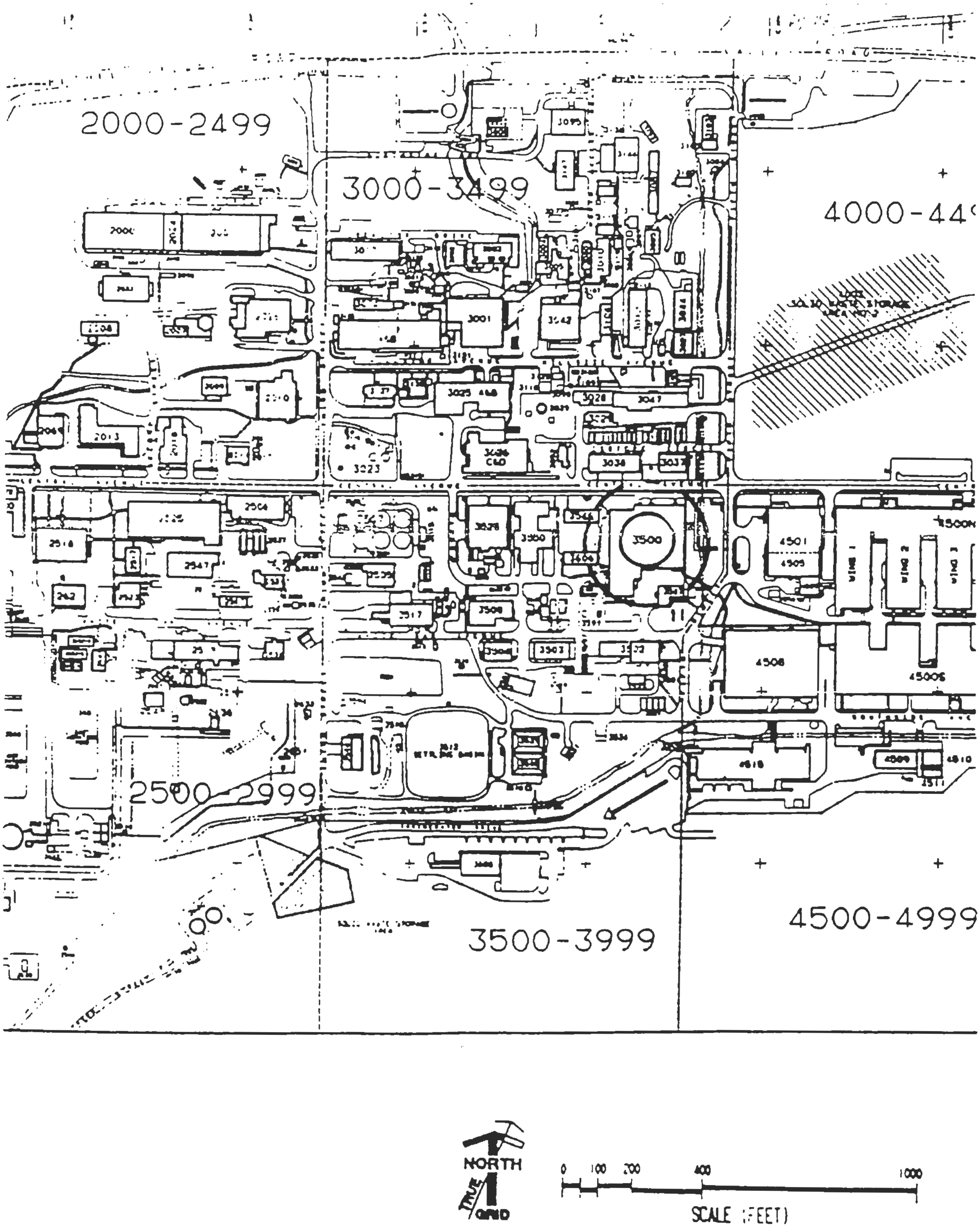


Fig. 6.1. Map showing Building 3500 location.

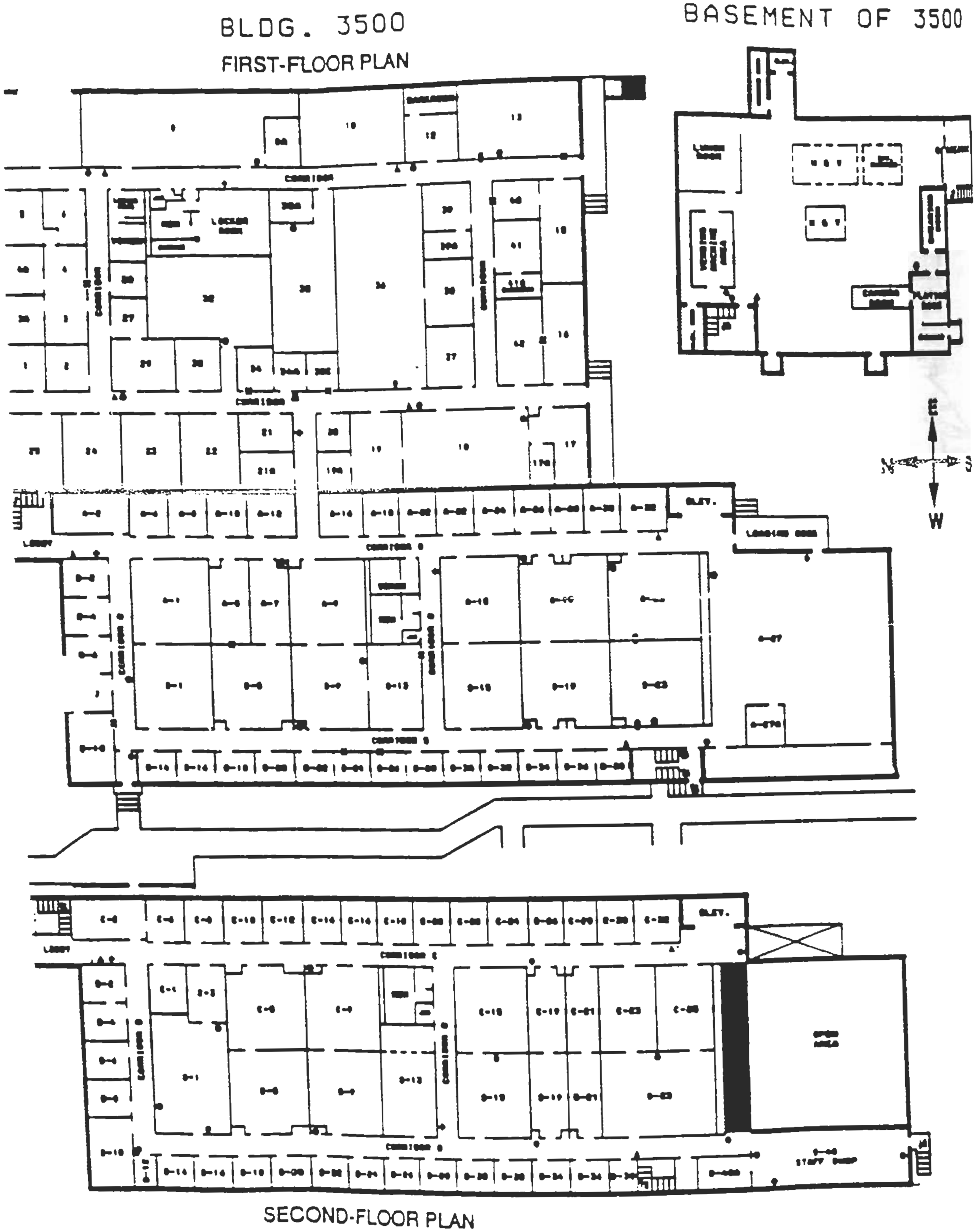


Fig. A.1.1. Building 3500 floor plan.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3500
	PARTITIONED AREA: Room D23

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[ ] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[Y] Other - Specify Locked File Cabinet		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[ ] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[Y] Other-specify Locked file cabinet			[Y] Emgergency Response
[ ] None			[ ] Other-specify

'ers between HEU and worker.
'ers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3500
	PARTITIONED AREA: Room D23

Question 2: BARRIER TYPES

ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Room, file cabinet - Protects worker from contamination

Public/Environment Barrier Narrative:

Fire Suppression System - Protects environment /public from radiological and chemical hazards
Alarm System - Protects environment /public from fire, radiological, and chemical hazards
Steel File Cabinet - Protects HEU containers from incipient stage fires
Facility/Building Boundary - Protects collocated worker, environment and public from radiological and chemical hazards.
Site Boundary - Protects environment and public from radiological and chemical hazards.

Criticality Barrier Narrative:

Administrative controls limit the allowable fissionable material mass to less than the ORNL Facility Material Control Limit (FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well defined control area without formal NCS approval. For fissionable material the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Material limits are established for HEU.
Authorization basis document is current and approved.
R--ords are maintained, systems are monitored and tested, and the building is inspected on a predetermined schedule.
er access to room is controlled and one employee has access to the file cabinet.
.cable Conduct of Operations are in place.
Emergency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3500
	PARTITIONED AREA: Room D23

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Sealed Sources	B0	Other-specify Steel File Cabinet	Unknown	9	0.0190

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

HEU is contained inside fission chambers that are stainless steel

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3500
	PARTITIONED AREA: Room D23

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Sealed Sources	B0	Other-specify Locked File Cabinet	Unknown	7	0(

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

HEU is contained inside fission chambers that are stainless steel

g 3500

External

e

plosion

takes

ance

e Temperat

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3500
	PARTITIONED AREA: Room D23

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.ity:

Fire - Under extreme conditions it is possible that a fire could threaten the integrity of HEU containers since the cabinet used to store the HEU does not have a designated fire resistance rating. The fire suppression system and readily availability of the on-site-fire department is expected to control the fire at the incipent stage. Improvred housekeeping practices and control of combustible loading in the lab would enhance the probability of controlling fire in the early stage.

Inadequacy of Design Basis - Design basis of the building is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94.

Design Deficiency - Design basis of the building is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94.

Human error could cause seal failure of the glass vial containing 5 grams of HEU.

Administrative controls governing the removal of the glass vial could minimize the chance of a spill.

Material :

Container Seal Degradation could result in possible containment failure due to human error during a process material transfer.

External:

Earthquake, subidence, and wind - Design basis of the building is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94. I

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3500
	PARTITIONED AREA: Room D23

Question 5: POTENTIAL EFFECTS

Facility

- [Y] Fire
- [ ] Explosion
- [Y] Contamination
- [ ] Criticality
- [Y] Leakage/Spills
- [ ] Other Accidents-specify

- [Y] Structural Failure
- [ ] Equipment Failure
- [Y] Material Release
- [ ] Increased Radioactivity Level
- [ ] Other-specify

Material

- [ ] Criticality
- [Y] Material Release
- [ ] Breach of Packaging
- [ ] Fire
- [ ] Other-specify

External

- [ ] Loss of Site Integ
- [Y] Loss of Building I
- [Y] Release of
- [ ] Radiation ar Releases from Cr

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3500
	PARTITIONED AREA: Room D23

Question 5: POTENTIAL EFFECTS

·ribe Each Effect Identified Above:

, acility:
Results of a fire could be an off-site release.

In a seismic or high wind event the building can collapse and can cause a breach of the steel file cabinet which could cause a breach of HEU containers integrity. The HEU in the glass container could create a contaminaton hazard if released.

A spill/leakage as a result of human error could cause a material release and contamination.

Material release:
A material release may result from the degradation of the seal to the glass vial.

External:
Loss of Building Integrity could result from a seismic or high wind event resulting in a breach of file cabinet and glass container of HEU creating a material release.

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 3500
	PARTITIONED AREA: Room D23

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)	Y	Y		Y			Y		

Explanation

Vulnerability for worker injury is unlikely since material release will be result of mishandling or human error in breaking glass vial or damaging seal. The contamination of the water and air is not credible. Public exposure and injury is not credible. No frisking when exiting after a spill in the room could result in ground contamination and public contamination by track-out.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3508
	FUNCTION: Laboratory 5

Question 1: SITE

Headquarters Facility Landlord: ER

Headquarters Program Sponsor: ER

Design Life: 100

Facility Age: 44

Location of Facility on Site and Distance to Site Boundary

Building 3508 is located on a flat site in the cenral zone, immediately east of building 3517 on White Avenue. The facility is several hundred feet from the site boundary.

Design Mission, Interim Mission, Current Use

The facility was formerly an Alpha Isolation Laboratory used by the Chemical Technology Division (until December 1985) and has residual alpha contamination as a result of this operation. The facility currently provides office, shop, and laboratory space for Instrument & Control (I & C) technical support and engineering personnel. Housed in this building is a fissile material vault storage area, which is part of Material Balance Area 135. The HEU in this vault exists in sealed source form, electrodeposited plates. This facility is used to provide technical support functions for the sitewide communication systems, security systems, and audiovisual systems.

Operational Status

Operating

Historical Information

Occureence Report :

ORO-MMES-CX10ENVIOHP-1990-0110, 04/25/91, Contamination

Other Regulatory Concerns: None Identified

:SB Concerns: None Identified

SITE: Oak Ridge National Laboratory		FACILITY (Building or Location)	Building 3508
		FUNCTION:	Laboratory 5

Question 1: SITE

Authorization Basis

..azard Screening approved (1992)

Describe Important or Unique Design Features

Building completely protected with an automatic wet-pipe sprinkler system that provides local occupant and fire department notification.

Describe Weaknesses in the Design Basis

Structural Design

Reinforced concrete

Partitioned Areas of HEU within facility

Lab 5

Description of Partitioned Areas

Lab 5 is a controlled entry area that contains the HEU in a vault and in a sealed glove box. The material in the vault has not bee moved since the closure of the Clinch River Breeder Reactor Project. The HEU (fission chambers) in the vault is contained in plastic bags then locked in a tool box then placed in the vault. The lab is locked and is a radiological control area. The material not handled. A negative pressure is maintained in the lab. A glove box in this lab contains a fission chamber scheduled for disassembly.

ount & Location of Hazardous Material Collocated or Commingled with HEU

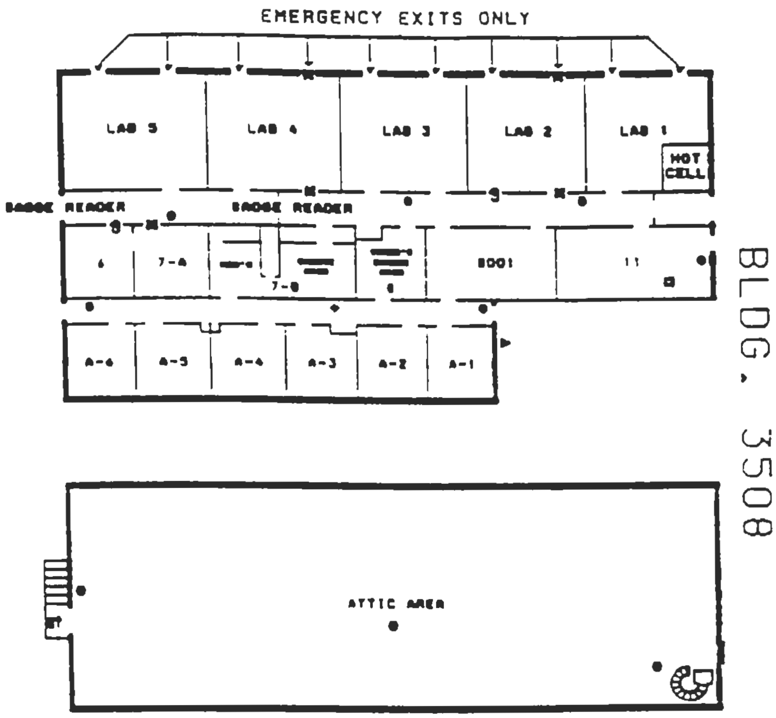
Process Material Transfers

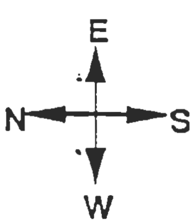
On-Site Transportation

Staff Levels & Experience

Applicable References

Hazard Screeing: HS/3508/F/1 (1992)





EVACUATION

1. LEAVE BUILDING BY NEAREST EXIT
2. ASSEMBLE AT POINTS A,B,C,D, OR E
3. WAIT FOR FURTHER INSTRUCTIONS

--------TEMPORARY PARTITION
▲ ALARMS
• EXTINGUISHERS
◆ BUILDING EMERGENCY SIGN
■ EMERGENCY CABINET
▮ SECURITY LOCKS
✖ NO THOROUGHFARE

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

:ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[Y] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[Y] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass	[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines	Absorbers	[ ] Configuration Control
[Y] Vault	[ ] Canyons	Geometry	[ ] Quality Assurance
[Y] Room	[ ] Pads	Interaction	[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary	Concentration	[Y] Authorization Basis
[ ] Hood	[ ] Trenches	Moderation	[Y] Training
[ ] Piping	[Y] Storage Vault	Enrichment	[ ] Organization
[ ] Shielding	[Y] Fire Suppression	Reflection	[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System	Volume)	[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[Y] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[ ] Other-specify			[Y] Emgergency Respon:
[ ] None			[ ] Other-specify

iers between HEU and worker.

iers between HEU and public/environment.

3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 2: BARRIER TYPES

·ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Vault - Protects worker from radiation.
Confinement System, gloveboxes - Protects worker from contamination
Room - Protects worker from radiological and chemical hazards
Alarm System - Protects worker by alerting to hazardous conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment and public from radiological and chemical hazards
HVAC/Confinement - Protects environment and public from radiological and chemical exposure during high consequence events
Site Boundary - Protects environment and public from radiological and chemical hazards
Storage Vault - Protects environment and public from radiological and chemical exposure during high consequence events
Fire Suppression System - Protects environment /public from fire, radiological, and chemical hazards
Alarm System - Protects environment /public from radiological and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the allowable amount of fissionable material mass to less than the ORNL Facility Material Control Limit (FMCL.) FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

Entry into the area is controlled via rad zone requirements and availability of keys/combinations
All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
M-terial limits are established for HEU.
·rization basis document is current and approved.
-rds are maintained, systems are monitored and tested, and building is inspected on a predetermined schedule.
Worker access to room is controlled and only one employee has access to the file cabinet.
Applicable Conduct of Operations are in place.
Emergency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3508
	PARTITIONED AREA: Lab 5

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Very Highly	Sealed Sources	B0	Vault	Unknown	2	0.0[illegible]

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Te HEU is electroplated on aluminum foil.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperatu
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Acc
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
[ ] Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

05,

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

..ity:

Human Error could result in the mishandling of the HEU.

Inadequacy of Design Basis - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure is unknown, seismic and high capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

This is an old facility with the support systems becoming high maintenance systems due to aging.

External:

Earthquakes, subsidence, and wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building has not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integ
[ ] Explosion	[ ] Material Release	[Y] Loss of Building I
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materia
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Cri
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[Y] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3508
	PARTITIONED AREA: Lab 5

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

. ..ility:
Mis-handling (human error) of the HEU could cause contamination. This HEU is not handled therefor minimizing these potential effect.

Structure Failure - In a seismic or high wind event , the steel vault may be buried under the building rubble as a result of structural failure. However, the structural integrity of the vault is not expected to be compromised and thus, the HEU is not expected to become a potential contamination hazard. However the glovebox is not expected to maintain its integrity.

External:
In a seismic or high wind event the possibility of loss of building integrity exists, creating a possible situation that could result in a release of material.

SITE: Oak National Laboratory	FAC LITY (Building or Location) Building 3508 PAR TITIONED AREA: Lab 5

Question 6: POTENTIAL CONSEQUENCE S

	Worker			Environm ent			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

The HEU is stored in the vault and a single fission chamber (HEU) is currently in a glove-box. Due to infrequency handling material and the storage configuration a material release is unlikely.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerab ity)

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 3525
	FUNCTION:	Hot Cell

Question 1: SITE

Headquarters Facility Landlord: ER

Headquarters Program Sponsor: ER & NE

Design Life: 40

Facility Age: 31

Location of Facility on Site and Distance to Site Boundary

The facility is located within the physical boundary of the Oak Ridge National Laboratory (ORNL) at the corner of Central Avenue and Fourth Street. The cell structure is ventilated to Building 3039 stack which is approximately 275 m south of the nearest public access.

Design Mission, Interim Mission, Current Use

The facility was designed to permit handling of high levels of radioactive materials through the use of shielded concrete walls, shielded viewing windows, and remote operated handling equipment. The mission was to provide a facility to examine radiation effects on both experimental fuels and materials through microstructure analysis, and gamma spectrometry. The current use includes the initial mission with the processing of iridium-92 isotope for commerical use.

The facility allows the safe examination, testing, and evaluation of a wide variety of materials, assemblies, component parts, and equipment that have been subject to high-level radiation. Important facility features include the use of shielding for gamma radiation, material containment through negative pressure differentials between areas, and equipment for remote operations. The atmosphere is not inert. The cell area is maintained at the most negative pressure with other areas outside the cell at less negative pressure.

The building (except for the hot cell storing HEU) is completely protected with an automatic wet-pipe sprinkler system. Manually actuated water fire protection sprinklers are installed in the northwest cell bank. A water pressure switch on the sprinkler system initiates a local fire alarm and alerts the onsite ORNL fire department. Sprinkler spacing and system pipe size is designed per "ordinary hazard" requirements. Valves controlling the water supply to the sprinkler system are locked in the open position with department padlocks.

The building is equipped with a fire alarm system consisting of automatic heat detectors throughout the building, manual fire alarm pullboxes, sprinkler systen alarm components, and evacuation horns.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	FUNCTION: Hot Cell

Question 1: SITE

:rational Status
operating

Historical Information
Occurrence Reports :

ORNL-89-04-CT-89-2, Contaminated basement being flooded due to an open fire protection sprinkler.

ORNL-89-4-OP-87-2, Release of a radioactive source from a shielded cask.

ORNL-89-14-CT-89-5, Failure of the facility containment system to achieve 0.3 inches water vaccum as required by the OSR.

ORNL-90-33-CT-90-5, Contamination of chemical operator and work area.

See Attachment A for occurrence reports since October 1990

List Authorization Basis

Describe Important or Unique Design Features

Describe Weaknesses in the Design Basis
The facility has not been evaluated against the latest natural phenomina requirements.

ctural Design
.k/cement block

Partitioned Areas of HEU within facility

Hot Cell
Storage
Charging Area

IMGA Cell

Description of Partitioned Areas

Amount & Location of Hazardous Material Collocated or Commingled with HEU

Process Material Transfers

On-Site Transportation

Staff Levels & Experience

Applicable References

rrence Report Number/ .cility Name	Occurrence Category	Report Type/ # of Occur.	Discovery Date	Report Date
ORO--MMES-X10CHEMTEC-1990-0096 Chemical Technology	Off-Normal	Final 1	09/17/90	11/15/90
TITLE: Employee skin and personal clothing contamination.				
ORO--MMES-X10METCER-1990-0188 Metals and Ceramics	Off-Normal	Final 1	10/23/90	01/30/91
TITLE: General Grouping: Personnel Radiation Protection Keyword: CONTAMINATION, Contaminated Item at Property Sales				
ORO--MMES-X10METCER-1991-0013 Oak Ridge X-10 Plant	Off-Normal	Final 1	01/09/91	03/18/93
TITLE: Radiation Evacuation Alarm				
ORO--MMES-X10METCER-1991-1003 Metals and Ceramics	Unusual	Final 1	07/18/91	06/02/92
TITLE: PERSONNEL CONTAMINATION IN REGULATED AREA				
ORO--MMES-X10METCER-1991-1004 Metals and Ceramics	Off-Normal	Final 1	08/05/91	06/02/92
TITLE: PERSONNEL CONTAMINATION				
ORO--MMES-X10METCER-1991-1006 Metals and Ceramics	Unusual	Final 1	09/16/91	07/09/93
TITLE: Building Evacuation System Quarterly Test				
ORO--MMES-X10METCER-1991-1007 Metals and Ceramics	Off-Normal	Final 1	10/02/91	06/02/92
TITLE: Personal Clothing Contamination				
ORO--MMES-X10METCER-1991-1010 Metals and Ceramics	Off-Normal	Final 1	10/30/91	06/02/92
TITLE: Personnel Contamination				
ORO--MMES-X10METCER-1991-1011 Metals and Ceramics	Unusual	Final 1	11/05/91	07/09/93
TITLE: Failure to perform documented monthly performance tests on Radiation Monitoring Equipment.				
ORO--MMES-X10METCER-1991-1012 Metals and Ceramics	Off-Normal	Final 1	12/16/91	06/02/92
TITLE: Personal Shoe Contamination				
ORO--MMES-X10METCER-1992-0002 Metals and Ceramics	Unusual	Final 1	02/07/92	07/09/93
TITLE: Building Evacuation System Quarterly Test				
ORO--MMES-X10METCER-1992-0003 Metals and Ceramics	Off-Normal	Final 1	02/13/92	01/27/93
TITLE: "Contamination" Occurrence initially categorized as less than off-normal. After initial investigation it is being upgraded to off-normal.				

rrence Report Number/ .acility Name	Occurrence Category	Report Type/ # of Occur.	Discovery Date	Report Date
ORO--MMES-X10METCER-1992-0004 Metals and Ceramics TITLE: Piping failure in Steam Control Cabinet	Off-Normal	Final 1	03/02/92	06/02/
ORO--MMES-X10METCER-1992-0005 Metals and Ceramics TITLE: Violation of Radiation Work Permit Procedure	Off-Normal	Final 1	03/10/92	06/02/
ORO--MMES-X10METCER-1992-0007 Metals and Ceramics TITLE: Contamination outside Regulated Area	Off-Normal	Final 1	03/27/92	03/18/
ORO--MMES-X10METCER-1992-0008 Metals and Ceramics TITLE: Skin Contamination	Off-Normal	Final 1	04/06/92	06/02
ORO--MMES-X10METCER-1992-0009 Metals and Ceramics TITLE: Contamination in Non-Radiological Area	Off-Normal	Final 1	04/09/92	12/31
ORO--MMES-X10METCER-1992-0010 Metals and Ceramics TITLE: Violation of Operation Safety Requirements	Unusual	Final 1	04/16/92	06/22
ORO--MMES-X10METCER-1992-0011 Metals and Ceramics TITLE: Personal Shoe Contamination.	Off-Normal	Final 1	05/05/92	03/18
ORO--MMES-X10METCER-1992-0013 Metals and Ceramics TITLE: Failure of Facility Radiation and Contamination Alarm System	Unusual	Final 1	06/04/92	03/18
ORO--MMES-X10METCER-1992-0015 Metals and Ceramics TITLE: PERSONNEL SKIN CONTAMINATION	Off-Normal	Final 1	06/18/92	03/18
ORO--MMES-X10METCER-1992-0017 Metals and Ceramics TITLE: Minor Fire in Hot Cell	Unusual	Final 1	07/13/92	06/0
ORO--MMES-X10METCER-1992-0018 Metals and Ceramics TITLE: Hot Cell Shield Inadequacy	Unusual	Final 1	07/16/92	07/0
ORO--MMES-X10METCER-1992-0020 Metals and Ceramics TITLE: Personal Clothing Contamination	Off-Normal	Final 1	07/22/92	01/2
O--MMES-X10METCER-1992-0022 tals and Ceramics TITLE: Contamination Found in Storm Drains	Off-Normal	Final 1	08/06/92	12/3

Report
Date

11/03/

11/03/

(:rence Report Number/ .cility Name	Occurrence Category	Report Type/ # of Occur.	Discovery Date	Report Date
ORO--MMES-X10METCER-1994-0002	Off-Normal	Final	02/17/94	06/13/94
Metals and Ceramics		1		
TITLE: Ventilation Fan Restart Failure				
ORO--MMES-X10METCER-1994-0004	Off-Normal	Final	03/30/94	05/17/94
Metals and Ceramics		1		
TITLE: Personnel Shoe Contamination				
C. --MMES-X10METCER-1994-0006	Off-Normal	Final	04/29/94	07/11/94
Metals and Ceramics		1		
TITLE: Facility Evacuation				
ORO--MMES-X10METCER-1994-0010	Off-Normal	Final	09/02/94	10/24/94
Metals and Ceramics		1		
TITLE: Failed Continuous Air Monitor				
ORO--MMES-X10METCER-1994-0011	Unusual	Final	09/08/94	10/24/94
Metals and Ceramics		1		
TITLE: Operational Safety Requirement Violation				
ORO--MMES-X10METCER-1994-0012	Unusual	Final	10/13/94	03/31/95
Metals and Ceramics		1		
TITLE: Operational Safety Requirement Violations				
O.--MMES-X10METCER-1994-0014	Off-Normal	Final	10/26/94	01/03/95
Metals and Ceramics		1		
TITLE: Personnel Electrical Shock				
ORO--MMES-X10METCER-1995-0001	Off-Normal	Final	02/09/95	03/31/95
Metals and Ceramics		1		
TITLE: Unplanned Building Evacuation				
ORO--MMES-X10METCER-1995-0002	Off-Normal	Final	03/08/95	06/02/95
Metals and Ceramics		1		
TITLE: Company Clothing Contamination				
ORO--MMES-X10METCER-1995-0004	Off-Normal	Final	03/30/95	11/02/95
Metals and Ceramics		1		
TITLE: Personnel Contamination				
ORO--MMES-X10METCER-1995-0005	Off-Normal	Final	06/26/95	09/05/95
Metals and Ceramics		1		
TITLE: Personnel Contamination				
ORO--MMES-X10METCER-1995-0008	Off-Normal	Final	07/10/95	09/05/95
Metals and Ceramics		1		
TITLE: Personnel contamination				
C -MMES-X10METCER-1995-0009	Off-Normal	Final	07/25/95	09/25/95
:als and Ceramics		1		
TITLE: Manual Evacuation Switches Inoperable				

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Charging Area

Question 2: BARRIER TYPES

ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Well - Protect worker from contamination and radiation
Confinement System - Protect worker from contamination
Alarm System - Protect worker by alerting to hazardus conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment/public from radiological and chemical hazards
HVAC/Confinement - Protects environment/public from radiological and chemical exposure during high consequence events
Well - Protects environment/public from radiological and chemical exposure during high consequence events
Site Boundary - Protects environment/public from radiological and chemical hazards
Fire Suppression System - Protects environment/public from radiological and chemical hazards
Alarm System - Protects environment/public from fire, radiological, and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the allowable fissionable material mass to less than the Facility Material Control Limit (FMCL). FM(defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area with forma' NCS approval. For fissionable matterial, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credib combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Authorization basis document is current and approved.
Material limits are established for hoods and storage areas.
W--ker access is controlled at entrance to partitioned areas.
'ds are maintained, systems are monitored and tested, the building is inspected on a predetermined schedule.
.cable Conduct of Operations are in place.
Emergency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Charging Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Reactor fuel	Enriched	Other Irrad recyclable	Shrink Fit	Other-specify Storage Well	1	2	0.0070

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Charging Area

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Acc
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

only Building 3525

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Charging Area

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[Y] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integ
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Critic
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Charging Area

Question 6: POTENTIAL CONSEQUENCES

Effect	Worker			Environment			Public		
	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Material)									

Explanation

Vulnerability does not exist for worker, environment or public. Material in well lined with stainless steel No analyses exists to show that a release of material due to natural phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Hot Cell

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U… below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike		[Y] Monitoring
[ ] Filter	[Y] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[ ] Room	[ ] Pads		[Y] Conduct of Operations
[Y] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[Y] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

ers between HEU and worker.
ers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Charging Area

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Material)									

Explanation

Vulnerability does not exist for worker, environment or public. Material in well lined with stainless steel. No analyses exists to show that a release of material due to natural phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Hot Cell

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U__ below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]

- [ ] Gloveboxes
- [ ] Transfer System
- [ ] Duct
- [ ] Filter
- [ ] Vault
- [ ] Room
- [Y] Hot Cell/Canyon
- [ ] Hood
- [ ] Piping
- [ ] Shielding
- [ ] Distance
- [ ] Respiratory Protection
- [ ] Protective Clothing
- [ ] Remote Handling
- Confinement System
- [ ] Burial Ground
- [ ] Tanks
- [Y] Alarm System
- [ ] Temporary Barriers
- [ ] Other-specify
- [ ] None

Public/Environmental Barrier[2]

- [Y] Facility/Building Boundary
- [Y] HVAC/Confinement
- [ ] Liquid Containment/Dike
- [Y] Bay, Cells, Magazines
- [ ] Canyons
- [ ] Pads
- [Y] Site Boundary
- [ ] Trenches
- [ ] Storage Vault
- [Y] Fire Suppression
- [Y] Alarm System
- [ ] Other - Specify

Criticality[1,2]

- [ ] Double Contingency Applied
- [Y] Double Contingency Not Applied (specify)
  (e.g., Mass
  Absorbers
  Geometry
  Interaction
  Concentration
  Moderation
  Enrichment
  Reflection
  Volume)

Administrative Barrier[3]

- [Y] Procedure: Operation, Maint.
- [Y] Material Limts
- [Y] Monitoring
- [ ] Configuration Control
- [ ] Quality Assurance
- [Y] Conduct of Operations
- [Y] Authorization Basis
- [Y] Training
- [ ] Organization
- [ ] Lessons-Learned
- [Y] Testing
- [ ] Trending
- [Y] Records
- [ ] Standards
- [ ] External Regulation
- [Y] Surveillance
- [ ] Personnel Reliability Assurance Program
- [Y] Worker/Access Occupancy Limits
- [Y] Emgergency Response
- [ ] Other-specify

...ers between HEU and worker.
...ers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

·atory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Hot Cell

Question 2: BARRIER TYPES

l above and its intended protective functions.

· from contamination and radiation
orker from contamination
y alerting to hazardous conditions

rrative:

:ects collocated workers, environment/public from radiological and chemical hazards
vironment/public from radiological and chemical exposure during high consequence events
environment/public from radiological and chemical exposure during high consequence events
ment/public from radiological and chemical hazards
ects environment/public from radiological and chemical hazards
ment/public from radiological and chemical hazards

allowable fissionable material mass to less than the Facility Material Control Limit (FMCL). FMCL is
: of fissionable material that can be present in an ORNL facility or well-defined control area without
nable material the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible
istances could lead to a criticality accident.

/e:

ccordance with written and approved procedures.
procedures.
current and approved.
r hoods and storage areas.
ntrance to partitioned areas.
s are monitored and tested, the building is inspected on a predetermined schedule.
s is in place.
l on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C3	Process Area	2	16	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

12/02/96

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location) Building 3525

PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C3	Process Area	2	20	0.0

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C3	Process Area	2	16	0.0010

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	U-233>10 ppm	Other	C3	Process Area	1	22	0.0010

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment.

FACILITY (Building or Location) Building 3525

SITE: Oak [Ridge] National Laboratory

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C3	Process Area	<1	7	0.0820

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

12/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	F1	Process Area	~15	27	[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

HEU is sandwiched between layers of aluminum.

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C0	Process Area	1	1	0.0250

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment.

12/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	U-233>10 ppm	Other	C0	Process Area	1	1	0.0[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	U-233>10 ppm	Other	C0	Process Area	1	1	0.0080

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

12/02/96

ing 3525

Cell

No. of Packages	
1	

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	Graphite	Process Area	20	1	0.0320

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mas (kg)
Sources and Samples	Enriched	Other	F1	Process Area	~15	27	(

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

HEU is sandwiched between layers of aluminum.

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	C3	Process Area	1	1	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

12/02/96

Mass (kg)
0.00

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Hot Cell

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Reactor fuel	Weapons	Other	Open	Process Area	1	111	0.2030

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment.

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 3525

PARTITIONED AREA: Hot Cell

Question 4: POTENTIAL CAUSES

Facility

- [ ] Process Material Transfer
- [ ] Inadvertent Transfers
- [Y] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [ ] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [Y] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- [ ] Design Deficiency
- [ ] Flooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [ ] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [ ] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydroloysis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperature
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transporation
- [ ] Adjacent Facility Accident
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Hot Cell

Question 4: POTENTIAL CAUSES

ıibe Each Potential Cause Identified Above:

.ılty:

Aging/Degradtion - The facility is thirty years old and the majority of the facility systems are original equipment.

Equiment Failure - With the facility thirty years old, facility equipment failures can expect to increase. The failures will probably not cause adverse conditions to the storage of the material because the material is stored in robust shielding. Manipulation of the material if needed could be limited.

Inadequacy of Design Basis - Design basis of the structure is unknown, the seismic and high capacity of the cells and of the equipment (fans) have not been evaluated, and the soil has not been characterized per current DOE standards.

Design Deficiency - Design basis of the structure is unknown, the seismic and high wind capacity of the cells and of the equipment (fans) have not been evaluated, and the soil has not been characterized per current DOE standards.

Externai.

Earthquake, subsidence, and wind - Design basis of the structure is unknown, the seismic and high wind capacity of the cells and of the equipment (fans) have not been evaluated, and the soil has not been characterized per current DOE standards.

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 3525

PARTITIONED AREA: Hot Cell

Question 5: POTENTIAL EFFECTS

Facility

- [Y] Fire
- [ ] Explosion
- [Y] Contamination
- [ ] Criticality
- [ ] Leakage/Spills
- [ ] Other Accidents-specify

- [Y] Structural Failure
- [ ] Equipment Failure
- [Y] Material Release
- [ ] Increased Radioactivity Level
- [ ] Other-specify

Material

- [ ] Criticality
- [ ] Material Release
- [ ] Breach of Packaging
- [ ] Fire
- [ ] Other-specify

External

- [ ] Loss of Site Integ
- [Y] Loss of Building
- [Y] Release of Mater
- [ ] Radiation and Releases from Crit

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: IMGA Cell

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

ility:
Potential loss of building integrity and material release to the worker is increased during a natural phenomena.

Potential aging equipment faillures increase the likely hood of personnel and area contaminations due to increased maintenance activities.

Potential eqiupment electrical failures from failed insulation as the result of aging equipment in high radiation fields has the potential to start fires from shorts.

External:
Material Release - Loss of shielding during an earthquake increases the potential for a material release.

Potential for loss of building integrity is increased during a natural phenomena.

SITE: Oak National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: IMGA Cell

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

No analyses exists to show that a release of material due to natural phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Storage

Question 2: BARRIER TYPES

-ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Cabinet - Protect worker from contamination
Confinement System - Protect worker from contamination
Alarm System - Protect worker by alerting to hazardus conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment/public from radiological and chemical hazards
HVAC/Confinement - Protects environment/public from radiological and chemical exposure during high consequence events
Site Boundary - Protects environment/public from radiological and chemical hazards
Fire Suppression System - Protects environment/public from radiological and chemical hazards
Alarm System - Protects environment/public from radiological and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the allowable fissionabl : material mass to less than the Facility Material Control Limit (FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Authorization basis document is current and approved.
Material limits are established for hoods and storage areas.
Worker access is controlled at entrance to partitioned areas.
Records are maintained, systems are monitored and tested, the building is inspected on a predetermined schedule.
:able Conduct of Operations are in place.
.gency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other Exp Archive	C0	Other-specify Locked file cabinet	3	1	0.0070

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other Exp archive	Plastic	Other-specify Locked file cabinet	2	1	[illegible]

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other Exp Archive	C0	Other-specify Locked file cabinet	5	1	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages
Sources and Samples	Weapons	Other Exp Archive	C0	Other-specify Locke file cabinet	3	1

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other Exp archive	C0	Other-specify Locked file cabinet	5	1	0.0010

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.
Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other Exp Archive	C0	Other-specify Locked file cabinet	3	8	0[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Material was included in 1993 SNF Vul Assessment

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Storage

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

06/20/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Storage

Question 4: POTENTIAL CAUSES

:ribe Each Potential Cause Identified Above:

.ity:

Aging/Degradtion - The facility is thirty years old and the majority of the facility systems are original equipment.

Equiment Failure - With the facility thirty years old, facility equipment failures can expect to increase. The failures will [illegible] cause adverse conditions to the storage of the material because the maerial is stored in robust shielding. Manipulation [illegible] needed could be limited.

Inadequacy of Design Basis - Design basis of the structure is unknown, the seismic and high capacity of the cells and of [illegible] (fans) have not been evaluated, and the soil has not been characterized per current DOE standards.

Design Deficiency - Design basis of the structure is unknown, the seismic and high wind capacity of the cells and of the [illegible] have not been evaluated, and the soil has not been characterized per current DOE standards.

External:

Earthquake, subsidence, and wind - Design basis of the structure is unknown, the seismic and high wind capacity of the [illegible] equipment (fans) have not been evaluated, and the soil has not been characterized per current DOE standards.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525 PARTITIONED AREA: Storage

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[ ] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

06/03/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 3525
	PARTITIONED AREA: Storage

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

.ential for loss of building integrity is increased during a natural phenomena.

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 3525
	PARTITIONED AREA: Storage

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Material)									

Explanation

No analyses exists to show that a release of material due to natural phenomena is incredible (see Generic Vulnerability)

Applicable References

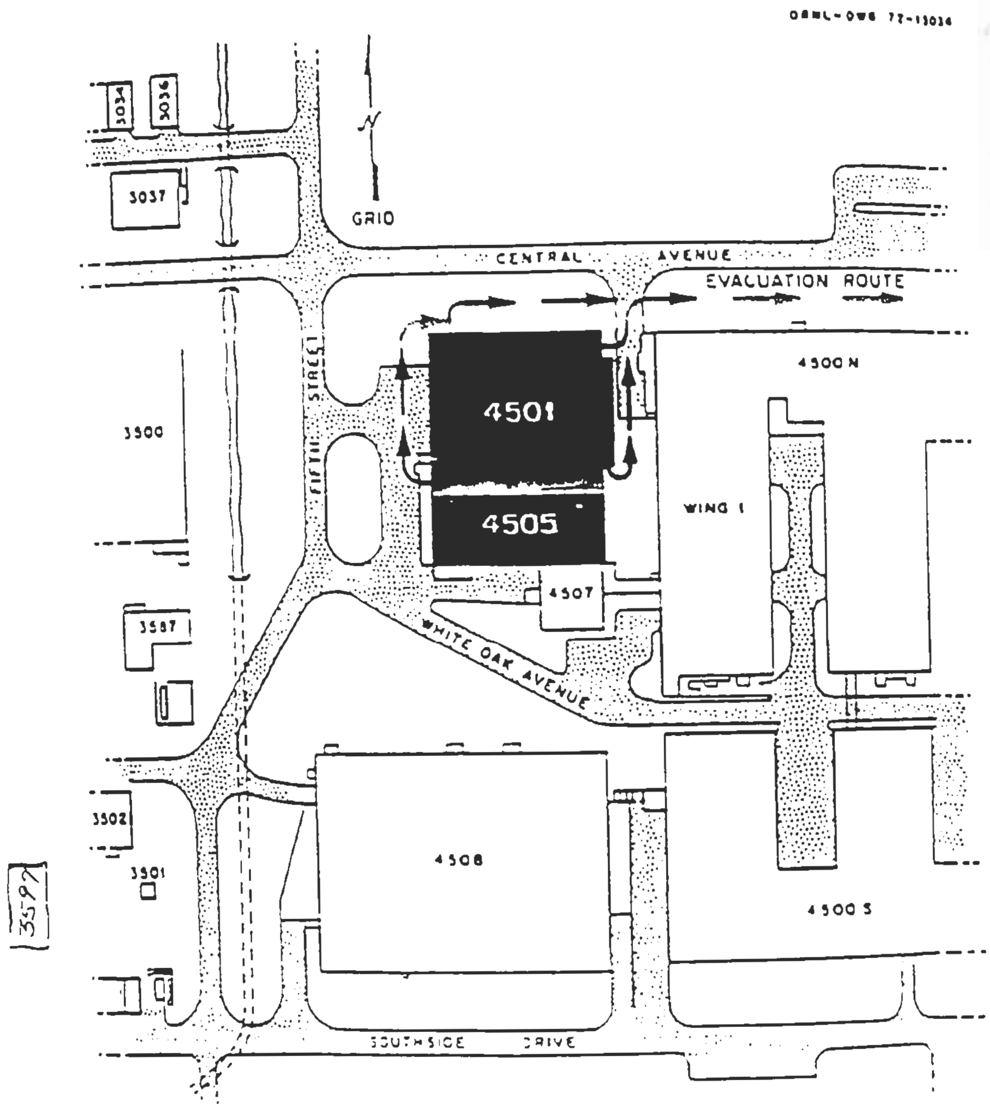


Fig. 1. Location of Building 4501 and adjacent building.

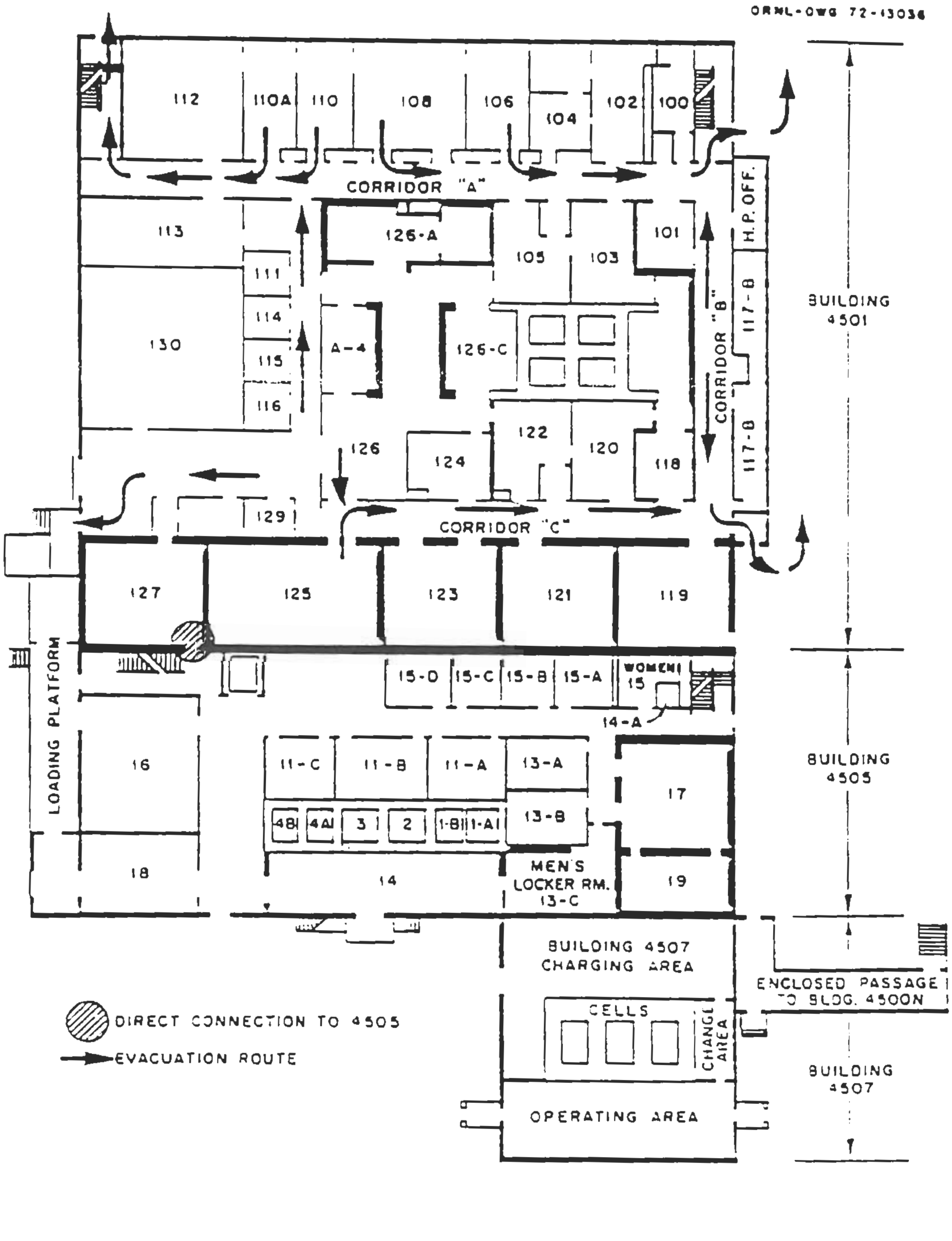


Fig. 3 First-floor Plan: Buildings 4501, 4505, and 4507.

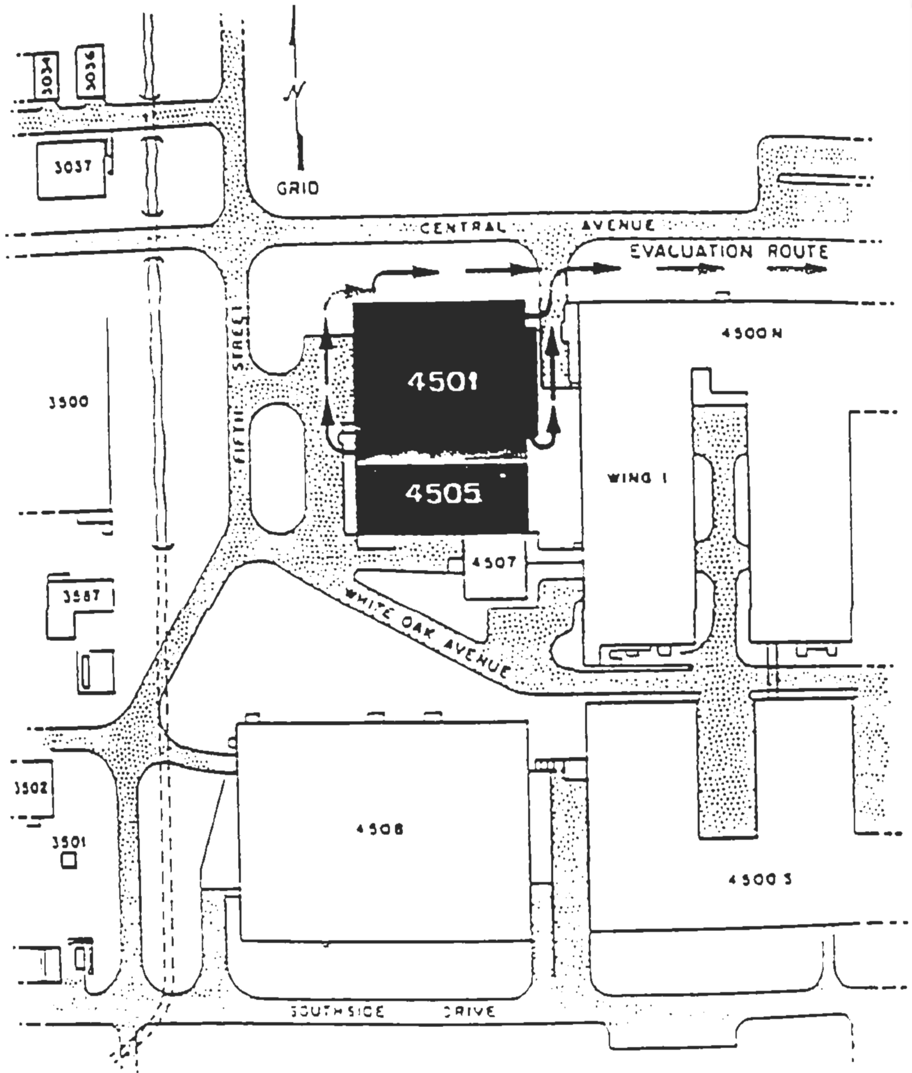


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Fig. 1. Location of Building 4501 and adjacent building.

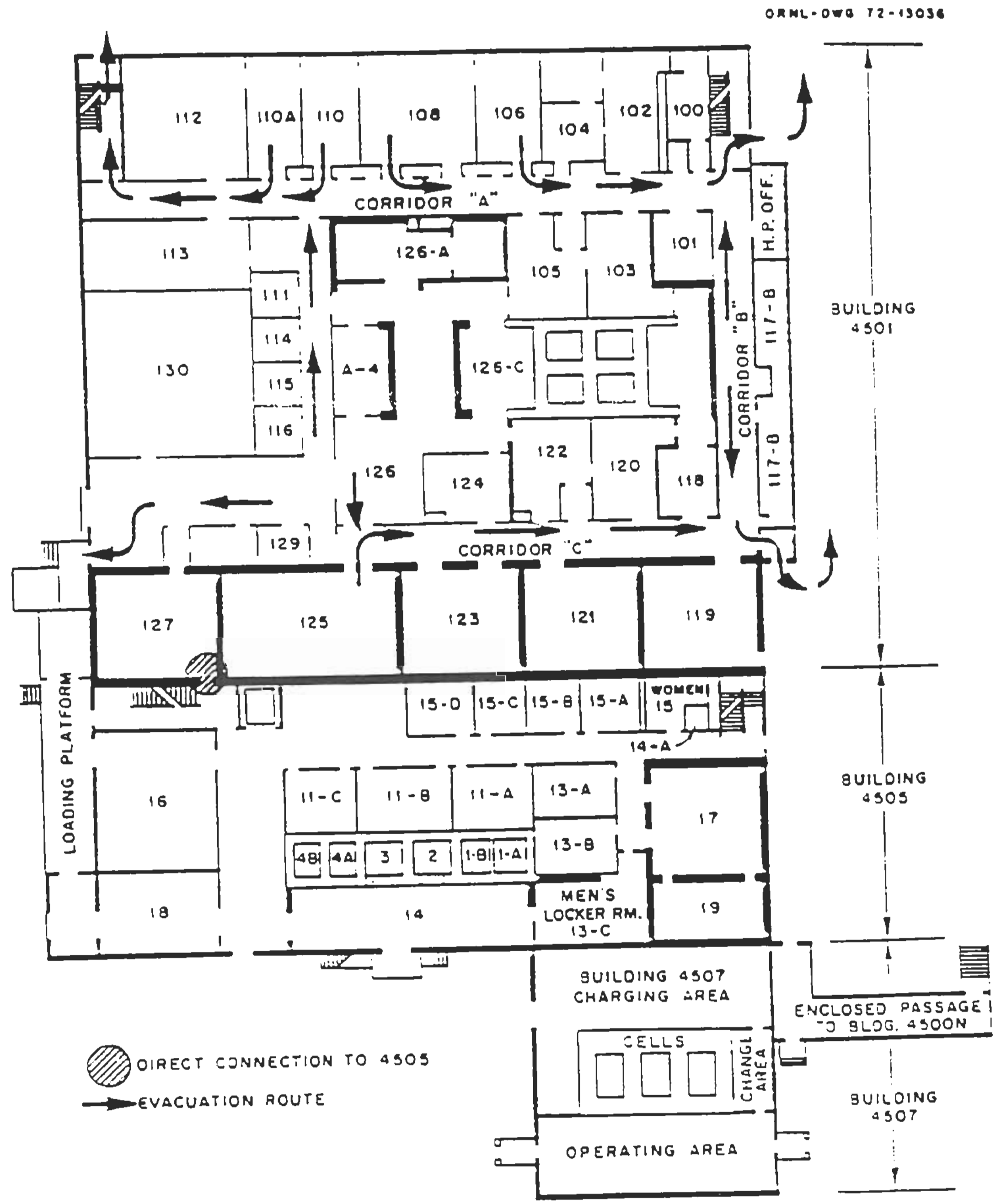

Fig. 3 First-floor Plan: Buildings 4501, 4505, and 4507.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 4501
	PARTITIONED AREA: Room 125

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mas (kg)
Process residues	U-233>10 ppm	Sludge	P0, B1	Vault	2	75	.

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

The amount of material is .000034 kg

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 4501
	PARTITIONED AREA: Room 125

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Solutions	U-233<10 ppm	Nitric acid	G2, Paint Can	Vault	6	1	0.0000

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Mass of material = .00005 kg

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 4501

PARTITIONED AREA: Room 125

Question 4: POTENTIAL CAUSES

Facility

- [ ] Process Material Transfer
- [ ] Inadvertent Transfers
- [Y] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [ ] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [Y] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [Y] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- [ ] Design Deficiency
- [ ] Flooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [Y] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [ ] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydroloysis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperat
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transporta
- [ ] Adjacent Facility A
- [ ] Other-specify

3. In
as

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Room 125

Question 4: POTENTIAL CAUSES

·ribe Each Potential Cause Identified Above:

.ity:

Administrative Controls help to minimize the chance of human error and the occurrence of a spill or release when handling the material.

Combustible Loading - Reduction of combustible loading and improved housekeeping would reduce/eliminate places for a fire to start.

Inadequacy of Design Basis - Design basis of the building structure is unknown, seismic and high wind capacity of the building has not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity of the building has not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

Facility is more than 40 yeras old. Systems, labs, and hot cell have been upgraded. Support systems have become high maintenace items due to aging.

Material:
Container seal degradation of the HEU solution in glass container with screw lid is an issue.

External:
Earthquakes, subsidence, winds - Design basis of the building structure is unknown, seismic and high wind capacity of the building has not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge Nationa

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Facility

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Explosion

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Contamination

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Leakage/Spills

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Room 125

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

akage/Spill - The spillage of HEU during a material transfer could cause a material release and contamination.

Material release - A fire would have the potential to dissipate smoke and fire water runoff throughout the facility. Also, from an accident while handling the material in the lab hood.

Structural Failure - In a seimic or high wind event, the steel vault embedded in the concrete wall may be buried under the building rubble in case of building collapse. However, the integrity of the steel vault is not expected to be compromised and thus, the HEU is not expected to become a potential contamination hazard.

Aging/degradation of equipment has the potential to cause a equipment failure.

Material:
The U233 contained in the glass container could be damaged (container seal degradation) as a result of a breach of the packaging. A material release could be the result.

External:
Loss of Building Integrity - In a seismic or high wind event a loss of building integrity could occur, whereby a material release could occur during a material transfer.

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 4501
	PARTITIONED AREA: Room 125

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Material)									

Explanation

The small amount of material present in the labs, storage configuration, and the restrictions on handling it mean ar effects will be small.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerab .ty).

Applicable References

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):** Building 4501 **PARTITIONED AREA:** Hot Cell Area

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

...ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U... below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality [1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike		[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[Y] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[Y] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[Y] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[Y] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[ ] Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[Y] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

...ers between HEU and worker.
...iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 2: BARRIER TYPES

ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Vault - Protects worker from radiation
Hot Cell/Canyon, room - Protects worker from radiological and chemical hazards
Hood - Protects worker from radiological and chemical hazards
Confinement System - Protects worker from contamination
Alarm - Protects worker by alerting to hazardous conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment/public from radiological and chemical hazards.
HVAC/Confinement - Protects environment/public from radiological and chemical exposure during high consequences.
Site Boundary - Protects environment/public from radiological and chemical hazards
Storage Vault - Protects environment/public from radiological and chemical exposure during high consequences.
Fire Suppresson - Protects environment/public from fire, radiological, and chemical hazards
Alarm System Protects environment/public from radiological and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the allowable fissionable material mass to less than the ORNL Facility Material Control Limit (FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
M terial limits are established for hoods and storage areas.
uthorization is current and approved.
rds are maintained, systems are monitored and tested, and building is inspected on a predetermined schedule.
Worker access is controlled at the entrance to the partitioned areas.
Conduct of Operations has been established for facility .
Emergency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Other Ceramic	G1, B1	Vault	>6	1	0.0020

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Process residues	U-233>10 ppm	Sludge	Res Appartus,	Other-specify Hot Celll	2	1	0.0

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Amount of material = .000036 kg

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[Y] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory

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Combustible Loading ... uction c ... for a fire to sta

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[Y] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 4501
	PARTITIONED AREA: Hot Cell Area

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

. -cility:
Leakage/Spill events are minimized by strict standards of personnel training focused on supervised hands-on experience.

Material release - A fire would have the potential to disipiate smoke and fire water runoff throughout the facility. Also, from an accide while handling the material in the lab hood.

Structural Failure - In a seismic or high wind event, the hot cell area may be buried under the building rubble in case of building col However, the integrity of the containers in the hot cell area are not expected to be compromised and thus, the HEU is not expected become a potential contamination hazard.

Aging/degradation of equipment has the potential to cause an equipment failure.

External:
Loss of Building Integrity - In a seismic or high wind event, loss of building integrity could occur, whereby, a material release could result.

SITE: Oak ' National Laboratory	FACILITY (Building or Location) Building 4501 PARTITIONED AREA: Hot Cell Area

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	**Contamination**	**Exposure**	**Injury**	**Ground**	**Water**	**Air**	**Contamination**	**Exposure**	**Injury**
Material Release (Facility)									

Explanation

The small amount of material present in the labs, storage configurqation, and the restrictions on handling it mean any effects will be small.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 5505
	FUNCTION:	Transuranium Research

Question 1: SITE

Headquarters Facility Landlord: Energy Research

Headquarters Program Sponsor: Energy Research

Design Life:

Facility Age: 29

Location of Facility on Site and Distance to Site Boundary

Building 5505 is located southeast of the High-Voltage Accelerator Laboratory, Building 5500, and south of White Oak Creek

Design Mission, Interim Mission, Current Use

The construction of TRL was completed in 1967. It is an office and laboratory building used by scientific/technical personnel conduct experiments with various isotopes of the heavy elements, namely the actinide elements. Consequently, the facility special containment features for the alpha-active materials as well as provisions for handling limited quantities of beta- and gamma-active materials. The TRL serves as a center for cooperative actinide research not only for ORNL staff but also the university participants and scientists from many other laboratories, both domestic and foreign.

Operational Status

Operating

Historical Information

Occurrence reports are:

ORO-LMES-X10CASD-1995-0001, 11/27/95, Fire in furnace hood system causing activation of fire suppression system
ORO-MMES-X10CHEM-1991-0115, 05/07/91, Personal shoe contamination
ORO-MMES-X10CHEM-1991-1001, 09/19/91, Personnel contamination
ORO-MMES-X10CHEM-1991-1003, 10/28/91, Personnel contamination
ORO-MMES-X10ENVIOHP-1991-1004, 05/07/93, Radiological surface activity found on high stool at K-722 propety sales
ORO-MMES-X10LABPROT-1990-0251, 01/21/91, General Grouping: Personnel safety evacuation caused by fire alarm

Other Regulatory Concerns: None Identified

DNFSB Concerns: 94-1 Implementation Plan

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	FUNCTION: Transuranium Research Lab

Question 1: SITE

: Authorization Basis

..nplementation Plan/Basis of Interim Operation (BIO) approved (1996)

Describe Important or Unique Design Features

Laboratories are located back-to-back in the central portion of the building separated by a central corridor.
The building is completely protected with an automatic wet-pipe sprinkler system. The fire alarm system provides local occupant and Fire Department notification.

Describe Weaknesses in the Design Basis

Structural Design

Brick/cement block

Partitioned Areas of HEU within facility

Lab 31

Room 45-A

Description of Partitioned Areas

Lab 31 contains hoods and HEU in various forms.
Room 45-A : A radionuclide storage room contains a storage cabinet where HEU is stored.

Amount & Location of Hazardous Material Collocated or Commingled with HEU

:ess Material Transfers

On-Site Transportation

Staff Levels & Experience

	Number of Employees	Average of years	Range
Supervision	2	30	0-30
Researcher	3	15	0-15

Applicable References

Central Location of TRL at ORNL

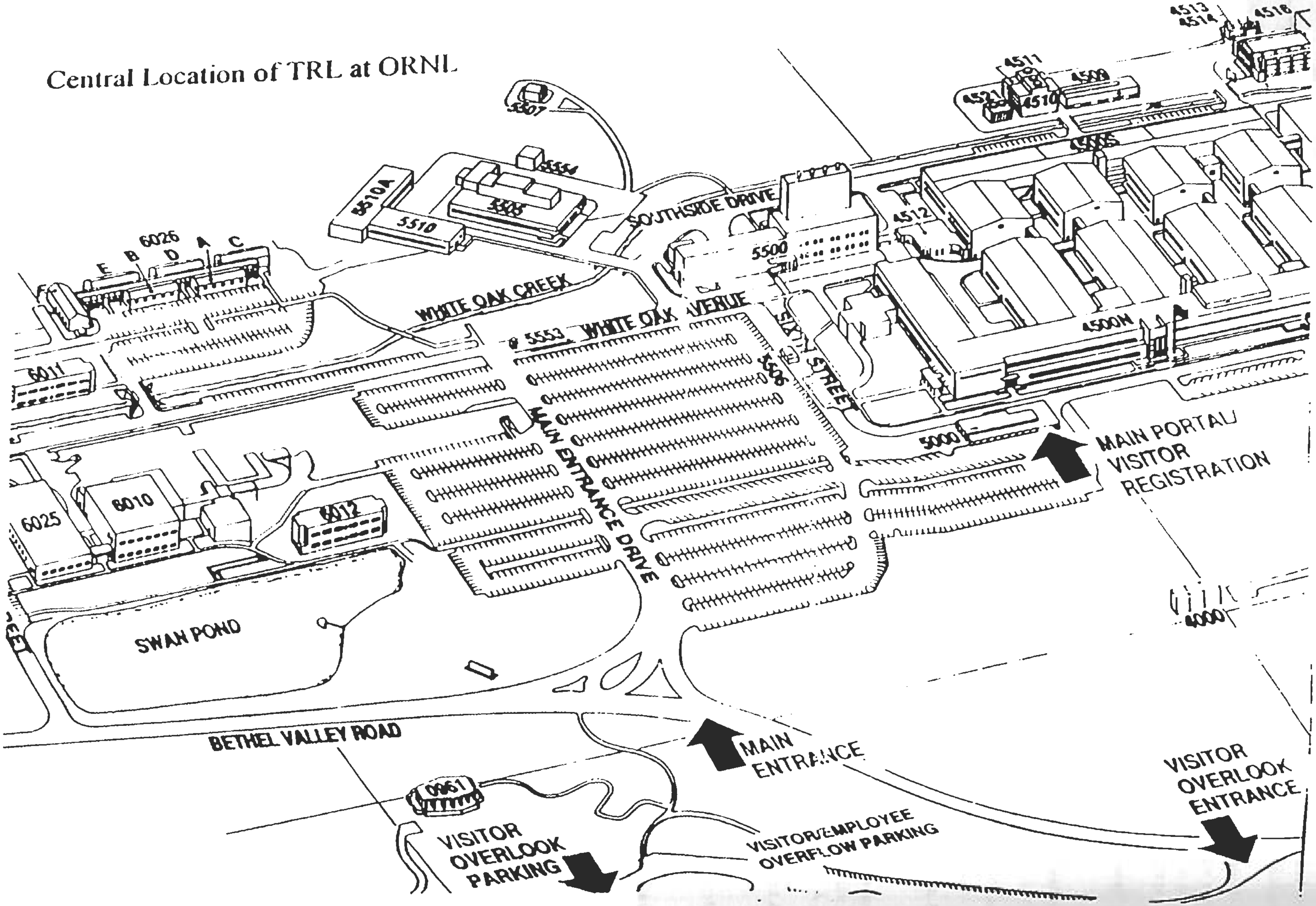
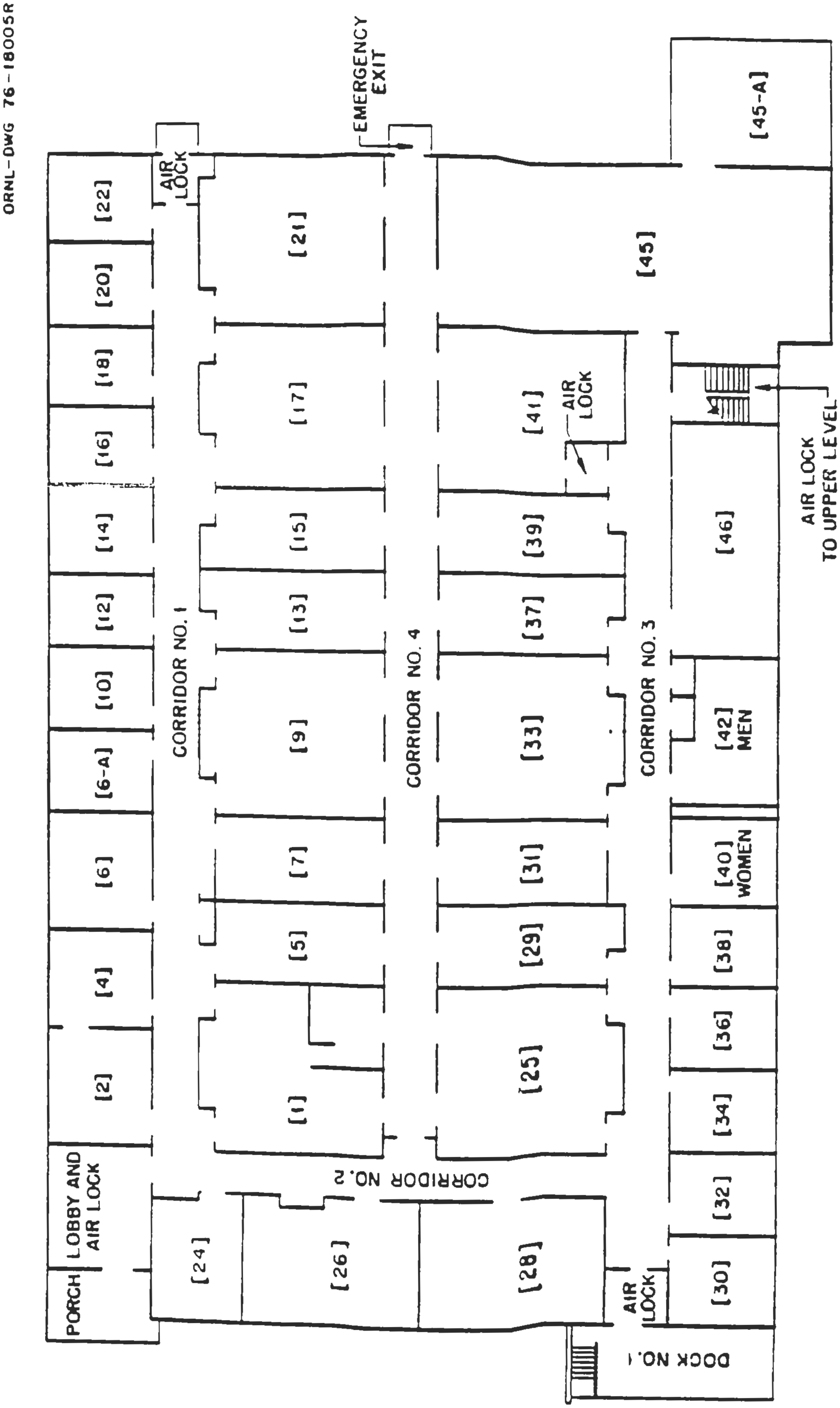


Fig. 3.2



FIRST FLOOR PLAN
TRL-BLDG-5505

Fig 3 4

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. Use below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]

- [ ] Gloveboxes
- [ ] Transfer System
- [ ] Duct
- [ ] Filter
- [ ] Vault
- [Y] Room
- [ ] Hot Cell/Canyon
- [Y] Hood
- [ ] Piping
- [ ] Shielding
- [ ] Distance
- [ ] Respiratory Protection
- [ ] Protective Clothing
- [ ] Remote Handling Confinement System
- [ ] Burial Ground
- [ ] Tanks
- [ ] Alarm System
- [ ] Temporary Barriers
- [ ] Other-specify
- [ ] None

Public/Environmental Barrier[2]

- [Y] Facility/Building Boundary
- [Y] HVAC/Confinement
- [ ] Liquid Containment/Dike
- [ ] Bay, Cells, Magazines
- [ ] Canyons
- [ ] Pads
- [Y] Site Boundary
- [ ] Trenches
- [ ] Storage Vault
- [Y] Fire Suppression
- [Y] Alarm System
- [ ] Other - Specify

Criticality[1,2]

- [ ] Double Contingency Applied
- [Y] Double Contingency Not Applied (specify)
  (e.g., Mass
  Absorbers
  Geometry
  Interaction
  Concentration
  Moderation
  Enrichment
  Reflection
  Volume)

Administrative Barri

- [Y] Procedure: Operation, Maint.
- [Y] Material Limts
- [ ] Monitoring
- [ ] Configuration Control
- [ ] Quality Assurance
- [Y] Conduct of Operations
- [Y] Authorization Basis
- [Y] Training
- [ ] Organization
- [ ] Lessons-Learned
- [Y] Testing
- [ ] Trending
- [Y] Records
- [ ] Standards
- [ ] External Regulation
- [Y] Surveillance
- [ ] Personnel Reliat Assurance Progı
- [Y] Worker/Access Occupancy Limi
- [Y] Emgergency Re
- [ ] Other-specify

…ers between HEU and worker.

…ers between HEU and public/environment.

3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U... below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality [1,2]	Administrative Barrier[3]
☐ Gloveboxes	Y Facility/Building Boundary	☐ Double Contingency Applied	Y Procedure: Operation, Maint.
☐ Transfer System	Y HVAC/Confinement	Y Double Contingency Not Applied (specify)	Y Material Limts
☐ Duct	☐ Liquid Containment/Dike	(e.g., Mass	☐ Monitoring
☐ Filter	☐ Bay, Cells, Magazines	Absorbers	☐ Configuration Control
☐ Vault	☐ Canyons	Geometry	☐ Quality Assurance
Y Room	☐ Pads	Interaction	Y Conduct of Operations
☐ Hot Cell/Canyon	Y Site Boundary	Concentration	Y Authorization Basis
Y Hood	☐ Trenches	Moderation	Y Training
☐ Piping	☐ Storage Vault	Enrichment	☐ Organization
☐ Shielding	Y Fire Suppression	Reflection	☐ Lessons-Learned
☐ Distance	Y Alarm System	Volume)	Y Testing
☐ Respiratory Protection	☐ Other - Specify		☐ Trending
☐ Protective Clothing			Y Records
☐ Remote Handling			☐ Standards
Confinement System			☐ External Regulation
☐ Burial Ground			Y Surveillance
☐ Tanks			☐ Personnel Reliability Assurance Program
☐ Alarm System			Y Worker/Access Occupancy Limits
☐ Temporary Barriers			Y Emgergency Response
☐ Other-specify			☐ Other-specify
☐ None			

...ers between HEU and worker.
...iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

5506

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Lab 31

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Enriched	Other	G1, W1, B1, C1	Other-specify Laboratory	2	1	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Lab 31

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mas (kg)
Sources and Samples	Enriched	Other	Volumetric, P1,	Other-specify Laboratory	2	3	

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Lab 31

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Very Highly	Other	G1, W1, B1, C1	Other-specify Laboratory	2	1	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Lab 31

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Other	G1, P1, W1, B1,	Other-specify Laboratory	2	4	0.[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[Y] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[Y] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[Y] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
[ ] Flooding		
[Y] Fire		
[ ] Other SAR Accidents		
[Y] Other-specify Storage/Containerization		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.ity:

Combustible Loading - Plastic sheathing draped over the front of some storage shelves and over the front of laminar flow hoods fire fuel source capable of rapid fire spread.

Fire - Fire could threaten the integrity of HEU containers prior to fire suppression system activation.

Inadequacy of Design Basis - Design basis of the building structure and HEPA filter equipment is unknown, seismic and high wi capacity of the building and equipment have not been evaluated, and the soil has not been characterized per current DOE standa DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure and HEPA filter equipment is unknown, seismic and high wind capacit building and equipment have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-

Material:

Container Seal Degradation - Based on the packaging configuration as shown in question 3, there is very little potential of contain degradation of the outside container.

External:

Earthquakes , subsidence, wind - Design basis of the building structure and HEPA filter equipment is unknown, seismic and hig capacity of the building and equipment have not been evaluated, and the soil has not been characterized per current DOE stand DOE-STD-1020-94

P

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[Y] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

Leakage/Spill - A spill of the glass containers/vials could result in isolated contaminaton in this area due to the ventilation controls other precautions. The spillage could be the result of a handling error.

Fire - A fire involving the plastic sheathing draped over the front of some storage shelves and the lamnar flow hoods could threate integrity of HEU containers prior to fire suppression system activation. Rad contamination distributed by smoke.

Structural failure - failure of building during seismic or high wind event could result in spill and material release of HEU stored on but very unlikely due to packaging configuration.

SITE: Oak ʳ National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Lab 31

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

This potential vulnerability occurs inside the lab. With the operation of the HEPA filter system, and the fire supression system, a release outside of lab or building is not expected.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building 5505

PARTITIONED AREA: Room 45-A

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment
U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]

- [ ] Gloveboxes
- [ ] Transfer System
- [ ] Duct
- [ ] Filter
- [ ] Vault
- [Y] Room
- [ ] Hot Cell/Canyon
- [ ] Hood
- [ ] Piping
- [ ] Shielding
- [ ] Distance
- [ ] Respiratory Protection
- [ ] Protective Clothing
- [ ] Remote Handling
  Confinement System
- [ ] Burial Ground
- [ ] Tanks
- [Y] Alarm System
- [ ] Temporary Barriers
- [Y] Other-specify
  Storage Cabinet
- [ ] None

Public/Environmental Barrier[2]

- [Y] Facility/Building Boundary
- [Y] HVAC/Confinement
- [ ] Liquid Containment/Dike
- [ ] Bay, Cells, Magazines
- [ ] Canyons
- [ ] Pads
- [Y] Site Boundary
- [ ] Trenches
- [ ] Storage Vault
- [Y] Fire Suppression
- [Y] Alarm System
- [ ] Other - Specify

Criticality[1,2]

- [ ] Double Contingency Applied
- [Y] Double Contingency Not Applied (specify)
  (e.g., Mass
  Absorbers
  Geometry
  Interaction
  Concentration
  Moderation
  Enrichment
  Reflection
  Volume)

Administrative

- [Y] Procedure: Operation, Main
- [Y] Material Limts
- [ ] Monitoring
- [ ] Configuration Control
- [ ] Quality Assuran
- [Y] Conduct of Operations
- [Y] Authorization Basis
- [Y] Training
- [ ] Organization
- [ ] Lessons-Learn
- [Y] Testing
- [ ] Trending
- [Y] Records
- [ ] Standards
- [ ] External Regulation
- [Y] Surveillance
- [ ] Personnel F Assurance
- [Y] Worker/Ac Occupancy
- [Y] Emgergen
- [ ] Other-spe

'ers between HEU and worker.
iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Room 45-A

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Pure oxides	G1, W1, B1, C1	Other-specify Flammable Storage Cabinet	1	1	0.0

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Multiple layers of containment

Describe material at risk, which constitutes a source term.

11i

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Room 45-A

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Impure	G1, W1, B1, C1	Other-specify Flammable Storage Cabinet	1	1	0.0080

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 5505
	PARTITIONED AREA:	Room 45-A

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	M (k
Solutions	Very Highly	Nitric acid	Volumetric, G1,	Other-specify Flammable Storage Cabinet	1	3	

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Room 45-A

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[Y] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[Y] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

06/20/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 5505
	PARTITIONED AREA: Room 45-A

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Solutions	Very Highly	Nitric acid	Volumetric, G1,	Other-specify Flammable Storage Cabinet	1	3	0.00

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Multiple layers of containment

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):** Building 5505
	PARTIONED AREA: Room 45-A

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[Y] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[Y] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

06/20/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Room 45-A

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.ty:
There is some possibility that during handling/transfer of HEU materials that a spill could result from improper handling or human error.

Inadequacy of Design Basis - Design basis of the building structure is unknown, seismic and high wind capacity of the building and equipment have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity of the building and equipment have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

Material:
Container Seal Degradation of the containers storing HEU is a possibility. Any release would be contained within the storage cabinet.

External:
Earthquakes, subsidence, and wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building and equipment have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Room 45-A

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 5505
	PARTITIONED AREA: Room 45-A

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

. ..ility:

Leakage/Spill - A spill of the glass containers/vials could result in isolated contaminaton in this area due to the ventilation contro other precautions.

Structural Failure - A collapse of the building as a reuit of a seismic or high wind event is not expected to instigate a HEU sp release of material stored in steel cabinets.

Material:

A release of material or breach of packaging of the stored material is unxpected during natural phenomena event.

External:

A loss of building integrity due to an earthquake is not expected to cause a release of materials in the storage cabinet.

SITE: Oak ˙ National Laboratory	FACILITY (Building or Location): Building 5505 PARTITIONED AREA: Room 45-A

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

The small amount of material present, the storage configuration, and the restrictions on handling the material , mean any effects will be small.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

tesign Life:

White Oak Ave

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 6010
	FUNCTION:	ORELA
Question 1: SITE		

Authorization Basis

ıazard Screening approved (1994)

Describe Important or Unique Design Features

The facility is protected by an automatic wey-pipe sprinkler system. The building fire alarm system sounds local evacuation horns and initiates a fire alarm signal to the on-site ORNL Fire Department.

Describe Weaknesses in the Design Basis

Structural Design

Reinforced concrete

Partitioned Areas of HEU within facility

Basement

Description of Partitioned Areas

The HEU is stored in heavily constructed UL listed 2-hr fire rated Mosler safes located in the basement. The basement is under key-code activited security system, off limits to unauthorized personnel.

Amount & Location of Hazardous Material Collocated or Commingled with HEU

cess Material Transfers

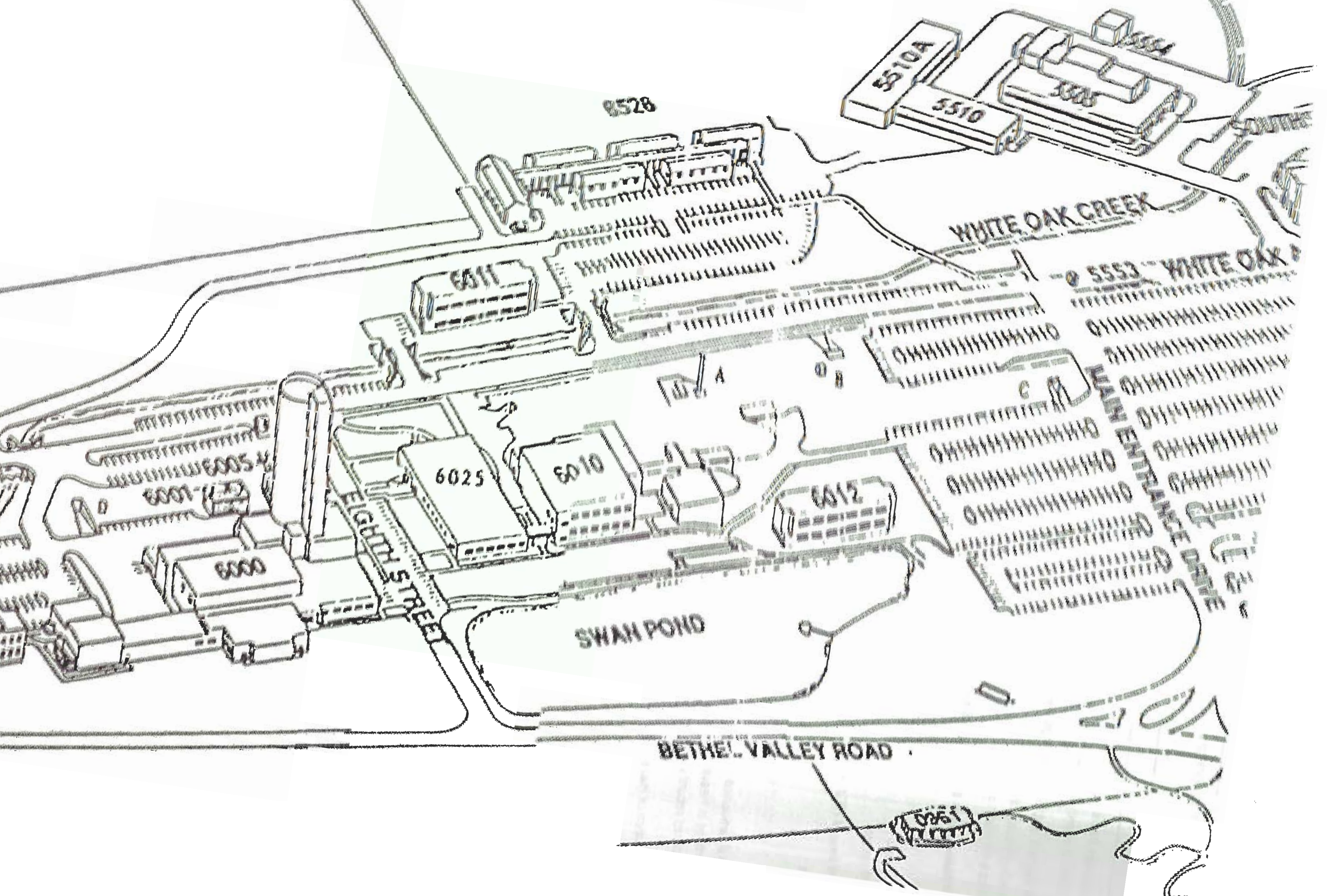
On-Site Transportation

Staff Levels & Experience

Applicable References

Hazard Screening: HS/6010-EPM/F/1/Rev1 (1994)

2 The 6000 area of Oak Ridge National Laboratory. Labels ...re; A, the ... nut stack; B, the entrance and air exhaust of the 85-m ...ht station; C, the ...ance to the 130-m flight station, and D, the entrance to th... -m flight station.



SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

.ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality [1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[ ] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[ ] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[Y] Other - Specify Safe		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[ ] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[Y] Other-specify Safe			[Y] Emgergency Response
[ ] None			[ ] Other-specify

'ers between HEU and worker.
.iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 2: BARRIER TYPES

...ite each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Safe - Protects worker from radiation
Room - Protects worker from radiological and chemical hazards

Public/Environment Barrier Narrative:

Facility/Building Boundary - protects collocated workers, environment and public from radiological and chemical hazards.
Safe - protects environment and public from radiological and chemical exposure during high consequence events
Fire suppression - protects environment and public from radiological and chemical hazards
Alarm System - protects environment and public from fire, radiological, and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the allowable fissionable material mass to less than the ORNL Facility Material Control Limit (FM... FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility, well-defined ... without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that ... credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written procedures.
Personnel are trained to current procedures.
Material limits are established for storage areas.
The authorization basis is current and approved.
Records are maintained, systems are monitored and tested, the building is inspected on a predetermined schedule.
Worker access is controlled to the partitioned area where HEU is stored.
...duct of operations has been established for facility
...gency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 6010
	PARTITIONED AREA:	Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Weapons	Pure metal	Polycarbonate	Other-specify Safe	~3	1	0.00

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	B0	Other-specify Safe	3	1	0.0090

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	C0	Other-specify Safe	~5	3	(

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal		Other-specify Safe	~5	2	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	F1	Other-specify Safe	~2	2	0

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	P0	Other-specify Safe	~3	1	0.0870

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

k Ridge National Laboratory	FACILITY (Building or Location)	Building 6010
	PARTITIONED AREA:	Basement

Question 3: HEU Holdings and Packaging

l Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
	Very Highly	Pure metal	Polycarbonate	Other-specify Safe	3	2	0.102

ative Inventory Differences

0

ribe packaging and its intended protective function(s).

cribe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	V0	Other-specify Safe	~10	5	0.0210

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	W2	Other-specify Safe	15	1	[illegible]

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 6010
	PARTITIONED AREA: Basement

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	W1	Other-specify Safe	3	1	0.0010

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

...dge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 4: POTENTIAL CAUSES

...ility	Material	External
Material Transfer	☐ Aging	☐ Fire
...tent Transfers	☐ Container Seal Degradation	☐ Explosion
...Degradation	☐ Pressurization	Y Earthquakes
...ent Failure	☐ Pyrophoricity	Y Subsidence
...e in Mission	☐ Radioactivity	Y Winds
Collocated Hazards	☐ Chemical Reactivity	☐ Floods
...ion/Embrittlement	☐ Radiolysis	☐ Extreme Temperature
...uate Configuration Knowledge	☐ Volumetric Expansion	☐ Snow
...ustible Loading	☐ Oxidation	☐ Ash Loading
...quate Seals	☐ Flammability	☐ Aircraft Crash
...r Sources	☐ Toxicity	☐ Vehicle Accident
...quate Drains	☐ Hydroloysis	☐ Onsite Transporation
...entive Maintenance Failure	☐ Crystallization	☐ Adjacent Facility Ac...
...inistrative Control	☐ Other - Specify	☐ Other-specify
...an Error		
...mical Reactions		
...tamination		
...dequacy of Design Basis		
...sign Deficiency		
...ooding		
...e		
...ther SAR Accidents		
...ther-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 4: POTENTIAL CAUSES

·ribe Each Potential Cause Identified Above:

.ility:

Human error in handling of the HEU.

Inadequacy of Design Basis - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure is unknown, seismic and high capacity of the building have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

External:
Earthquakes, subsidence, wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Int
[ ] Explosion	[ ] Material Release	[Y] Loss of Building
[Y] Contamination	[ ] Breach of Packaging	[ ] Release of Mat
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 6010
	PARTITIONED AREA: Basement

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

...e structural integrity of the safes is not expected to be compromised during a building collapse and thus the HEU is not expected to become a potential contamination hazard. High winds will not have any adverse impact on the safes.

Ridge National Laboratory	FACILITY (Building or Location)	Building 7001A
	FUNCTION:	Isotopes Vault

Question 1: SITE

orization Basis

creening approved (1991)

Important or Unique Design Features

ɔpes storage vault is protected by an automatic dry-pipe sprinkler system. The building fire alarm system sounds loc on horns and initiates a fire alarm signal to the on-site ORNL Fire Department

ɜ Weaknesses in the Design Basis

ral Design

ement block

ɔned Areas of HEU within facility

A

iption of Partitioned Areas

unt & Location of Hazardous Material Collocated or Commingled with HEU

.d amount material will be stored in this facility, but all hazardous material will be in DOT approved shipping containe

ess Material Transfers

Site Transportation

iff Levels & Experience

ɔplicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

...ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment ... below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barri...
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limits
[ ] Duct	[ ] Liquid Containment/Dike		[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[Y] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[Y] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[ ] Other-specify			[Y] Emgergency Resp...
[ ] None			[ ] Other-specify

...ers between HEU and worker.
...iers between HEU and public/environment.
3. Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 2: BARRIER TYPES

·ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Room - Protects worker from radiological and chemical hazards
Shielding - Protects worker from radiation
Alarm System - Protects worker by alerting to hazardous condition

Public/Environment Barrier Narrative:

Fire Suppression System - Protects public/environment from radiological and chemical hazards.
Alarm System - Protects public/environment from radiological and chemical hazards.
Facility/Boundary Boundary - Protects collocated workers, environment and public from fire, radiological, and chemical hazards
Site Boundary- Protects public/environment from radiological and chemical hazards.

Criticality Barrier Narrative:

Administrative controls limit the amount of fissionable material mass to less than the ORNL Facility Material Control Limit(FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Material limits are established.
Records are maintained, systems are monitored and tested, building is inspected on a predetermined basis.
Worker access to vault is controlled.
Applicable Conduct of Operations is in place.
E⁻ergency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7001A
	PARTITIONED AREA: 7001A

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
						0	0.0

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[ ] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
[ ] Design Deficiency		
[ ] Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 4: POTENTIAL CAUSES

·ribe Each Potential Cause Identified Above:

.ity:

Inadequacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

External:

Earthquakes, subsidence,and wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[ ] Loss of Building Integrity
[ ] Contamination	[ ] Breach of Packaging	[ ] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge Nation

1A

Each Effect Ide

failure of the f

orker or public t

SITE: Oak ' National Laboratory	FACILITY (Building or Location): Building 7001A
	PARTITIONED AREA: 7001A

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

Vulnerabiliy does not exist for this facility; HEU when stored in facility will be in DOT transportation container. No analysis exist ot show that a release of material due to natural phenomena is incredible (See Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7710
	FUNCTION: Dosimetry Applications

Question 1: SITE

Headquarters Facility Landlord:

Headquarters Program Sponsor:

Facility Age: 0

Design Life:

Location of Facility on Site and Distance to Site Boundary

Building 7710 is one of three buildings located in Material Balance Area 131. The other buildings are 7712 and 7735. Building 7710 is about 1 mile from Melton Hill Lake (part of the ORNL boundary) and about 3 miles from the nearest public highway.

Design Mission, Interim Mission, Current Use

Building 7710 is a general purpose building built in the 1950s with an addition in the 1960s. The building houses nine offices, labs, and four speciality rooms including a reactor control room, a low-background counting room, and an environmental chamb Activities in the building include; administration, radiochemical analysis, instrumentation, calibration and support of programs of DOE's Office of Environmental Technology Development and Office of Health and Environmental Research. This facility's gene mission is using sealed sources to develop better approaches for the measurement of radiation fields (for personnel dosimetry) radioactive contamination (for environmental remediation).

Operational Status

In use

Historical Information

Occurrence Reports:

ORO-MMES-X10BRESRX-1992-0001, 06/24/92, Contamination in non-radiological Area

ORO-MMES-X10HERD-1994-0001, 10/27/94, Electrical Outage Disrupts Normal Operations

er Regulatory Concerns: None Identified

DNFSB Concerns: None Indentified

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7710
	FUNCTION: Dosimetry Applications

Question 1: SITE

: Authorization Basis

ıazard Screening approved (1991)

Describe Important or Unique Design Features

The facility is protected by an automatic wet-pipe sprinkler system. The builidng fire alarm system sounds local evacuation horns and initiates a fire alarm signal to the on-site ORNL Fire Dapartment.

Describe Weaknesses in the Design Basis

Sprinklers not provided below ceiling of caged storage area.

Structural Design

Steel frame

Partitioned Areas of HEU within facility

Room C208

Description of Partitioned Areas

Room C208 contains an concrete block area with a cage door that contains an UL listed 2-hour fire rated safe that houses the HEU material.

Amount & Location of Hazardous Material Collocated or Commingled with HEU

Material located in safe with HEU:

¹Cm	1.38E-05 Ci
ϑPu	1.48E+01 Ci

The 239Pu sources will be shipped to LANL in June 1996.

Material located in cage containing safe;\

60Co	3.98E-02
137Cs	5.49E-02
147Pu	5.91E-03
90Sr	2.96E-02
204T1	2.77E-04

Process Material Transfers

On-Site Transportation

Staff Levels & Experience

	Number of Employees	Average HEU Experience (yr)	Range (yr)
ᐧᐣA Coordinator	1	15	15
MBA Coordinator	1	8	8

Applicable References

Hazard Screenng: HS/7735/F/1/R0 (1991)

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7710 PARTITIONED AREA: Room C208

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

...ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. Use below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass, Absorbers, Geometry, Interaction, Concentration, Moderation, Enrichment, Reflection, Volume)	[Y] Material Limits
[ ] Duct	[ ] Liquid Containment/Dike		[ ] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[Y] Other - Specify UL listed 2-hour fire rated safe		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[ ] Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[ ] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emergency Response
[Y] Other-specify UL listed 2-Hour Fire Rated Safe			[ ] Other-specify
[ ] None			

...ers between HEU and worker.
...ers between HEU and public/environment.
3. Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7710
	PARTITIONED AREA: Room C208

Question 2: BARRIER TYPES

ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Room - Protects worker from radiological and contamination hazards
Safe - Protects worker from radiological hazards

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects colllocated workers, environment, and public from radiological hazards
Site Boundary - Protects environment and public from radiological and chemical hazards
Safe - Protects environment and public from radiological and chemical exposure during high-consequence events
Fire Suppression - Protects emvironment and public from radiological and chemical hazards
Alarm System - Protects environment and public from fire, radiological, and chemical hazards

Criticality Barrier Narrative:

Administrative controls limit the amount of fissionable material mass to less than the ORNL Facility Material Control Limit (FMCL). FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or a well-defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that no credible combination of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Material limits are established for areas.
Authorization basis document is current and approved.
Records are maintained, systems are monitored and tested, and building is inspected on a predetermined schedule.
Worker acess is controlled to cage area and safe
cable Conduct of Operations are in place..
rgency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7710
	PARTITIONED AREA: Room C208

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Sources and Samples	Weapons	Sealed Sources	V1	Vault	30	12	0.0[illegible]

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

HEU is contained inside a fission chamber, consisting of a welded aluminum cylinder approximately 12 inches long and 2 inches in diameter.

Describe material at risk, which constitutes a source term.

The material is 93% enriched uranium plated on the inside of the welded aluminumcylinders.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7710
	PARTITIONED AREA: Room C208

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7710
	PARTITIONED AREA: Room C208

Question 4: POTENTIAL CAUSES

'ribe Each Potential Cause Identified Above:

..ity:

Inadequacy of Design Basis - Design basis of the building structure is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per current standard, DOE-STD-1020-94.

Design Deficiency - Design basis of the building structure is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per current standard, DOE-STD-1020-94; Sprinklers not provided below the ceiling of the caged storage area. This is not seen as an issue in regard to HEU.

Human Error could result in potetial spill of HEU solution.

External:

Earthquakes, subsidence, wind - Design basis of the building structure is unknown, the seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized per current standard, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7710
	PARTITIONED AREA: Room C208

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[ ] Breach of Packaging	[ ] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

g 7710

Howe...

SITE: Oak National Laboratory	FACILITY (Building or Location) Building 7710
	PARTITIONED AREA: Room C208

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

Vulnerability does not exist for worker, environment or public since the safe containing the HEU is expected to retain its integrity during a seismic event.

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7824
	FUNCTION: WEAF

Question 1: SITE

Headquarters Facility Landlord:

. Headquarters Program Sponsor:

Design Life: 0

Facility Age: 0

Location of Facility on Site and Distance to Site Boundary

Building 7824, Waste Examination and Assay Facility (WEAF) is located in Solid Waste Storage Area (SWSA) 5 North, within the confines of ORNL. Primary Acess to SWSA 5 North is via Lagoon Road and Melton Valley Drive. The closet point of unrestricted public access to the WEAF is Guard Post 2, which is located approximately 1240 meters north-northwest. (see Fig 1 and Fig 2).

Design Mission, Interim Mission, Current Use

The WEAF is primarily used to perform nondestructive examination and assay of the contents of waste containers. The WEAF is also used for nondestructive examination and assay of miscellaneous radioactive and nonradioactive nonwaste items, and research and development in pulsed neutron, gamma, and x-ray detection applications in which energized radiation sources are used.

Operational Status

Operating

Historical Information

Occurrence reports: None Identified

Other Regulatory Concerns: None Identified

DNFSB Concerns: None Identified

List Authorization Basis

Basis for Interim Operation (BIO) approved (1996)

Describe Important or Unique Design Features

'ding is protected with an automatic wet-pipe sprinkler system. Building fire alarm sounds local evacuation horns and initiat alarm signal to the on-site ORNL Fire Department.

Describe Weaknesses in the Design Basis

Structural Design

Steel frame

Partitioned Areas of HEU within facility

Assay Area

Description of Partitioned Areas

Amount & Location of Hazardous Material Collocated or Commingled with HEU

Process Material Transfers

On-Site Transportation

'f Levels & Experience

Applicable References

BIO: ORNL/WM-ARMD/7824/BIO/R0 (1996)

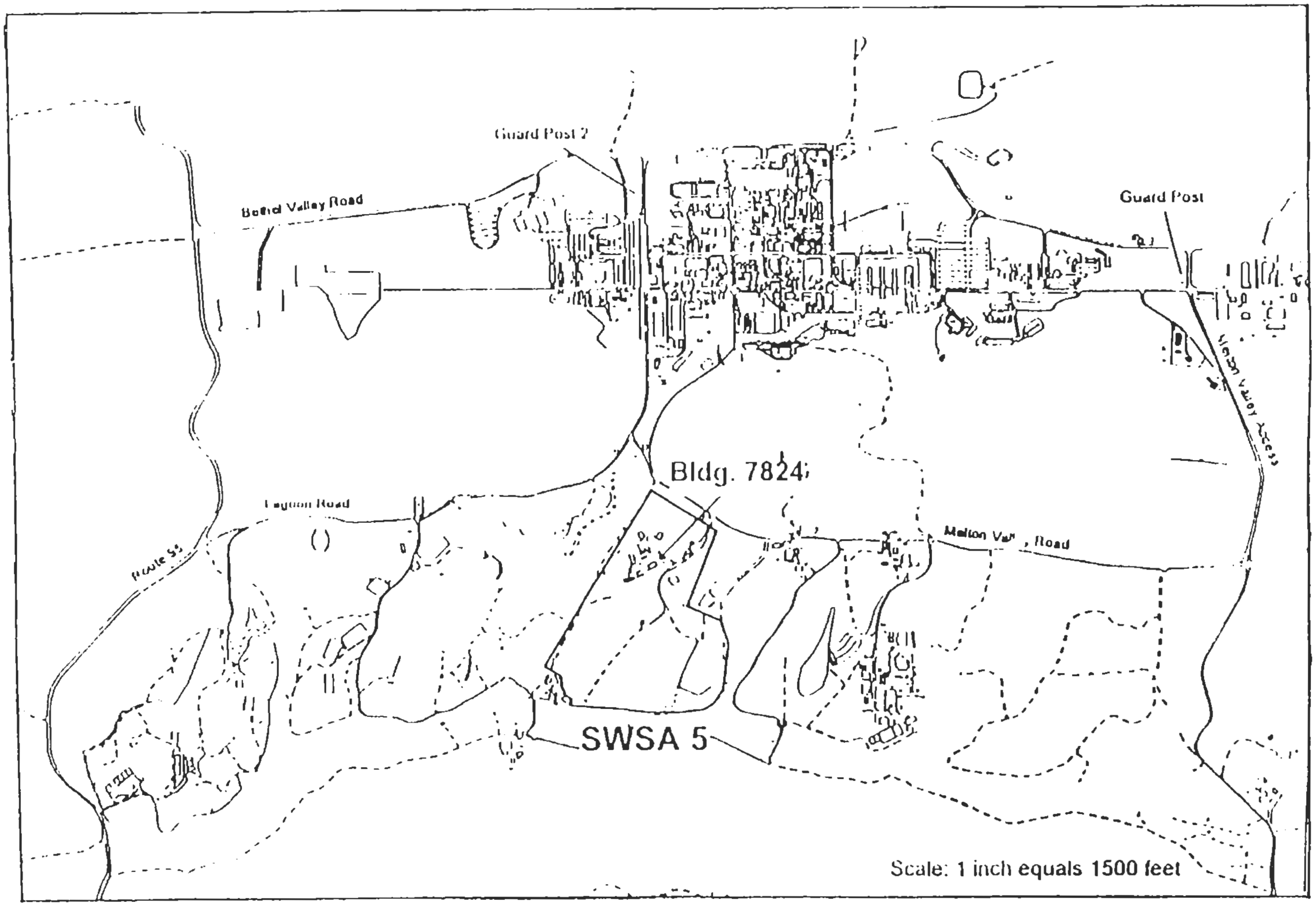


Fig. 1.1. Location of Solid Waste Storage Area 5 at Oak Ridge National Laboratory.

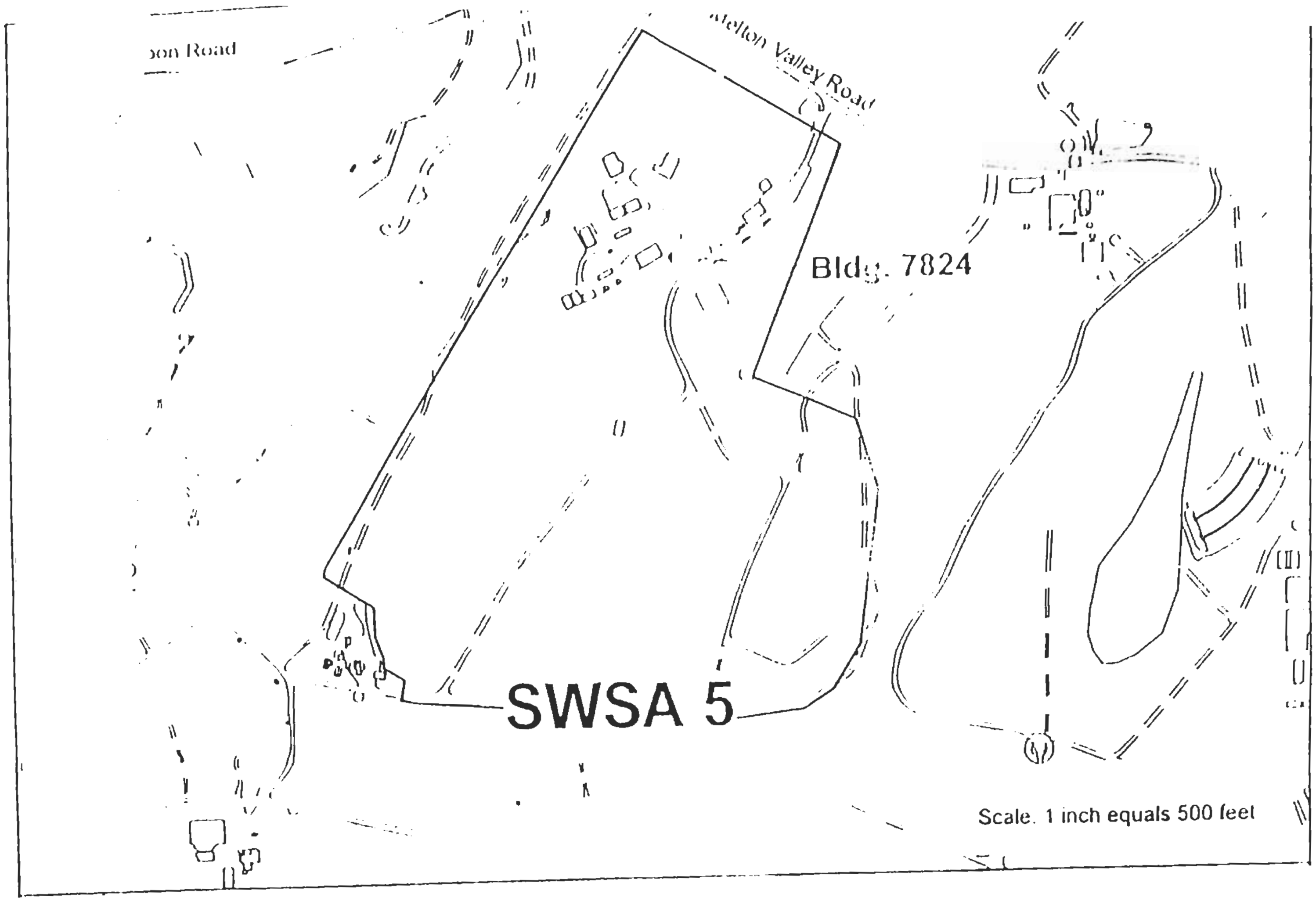


Fig. 1.2. Location of the Waste Examination and Assay Facility in Solid Waste Storage Area 5.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U… pelow for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass	[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines	Absorbers	[ ] Configuration Control
[ ] Vault	[ ] Canyons	Geometry	[ ] Quality Assurance
[Y] Room	[ ] Pads	Interaction	[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary	Concentration	[Y] Authorization Basis
[ ] Hood	[ ] Trenches	Moderation	[Y] Training
[ ] Piping	[ ] Storage Vault	Enrichment	[ ] Organization
[ ] Shielding	[Y] Fire Suppression	Reflection	[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System	Volume)	[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[Y] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[Y] Other-specify Locked Cabinet			[Y] Emgergency Response
[ ] None			[ ] Other-specify

ers between HEU and worker.
ers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

ge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 2: BARRIER TYPES

barrier identified above and its intended protective functions.

er Narrative:

l cabinet - Protects worker from radiological and chemical hazards
- Protects worker by alerting to hazardous condition

onment Barrier Narrative:

ng Boundary - Protects collocated workers, environment and public from radiological and chemical hazards
y - Protects public/environment from radiological and chemical hazards
sion System - Protects public/environment from radiological and chemical hazards
m - Protects public/environment from fire, radiological, and chemical hazards

arrier Narrative:

ve controls limit the amount of fissionable material mass to less than the ORNL Facility Material Control Limit (FMC fined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control nal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen to be small enough that nc mbination of unplanned circumstances could lead to a criticality accident.

ative Barrier Narrative:

ons are performed in accordance with written and approved procedures.
are trained to currrent procedures.
mits are established for areas.
ire maintained, systems are monitored and tested, and building is inspected on a predetermined basis.
ccess is controlled to the facility.
e Conduct of Operations are in place.
cy response is provided on a 24 hour per day basis.
ition basis document is current and approved

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7824
	PARTITIONED AREA: Assay Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Pure oxides	SS Capsule	Other-specify Cabinet	13	8	0.0013

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

11/26/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7824
	PARTITIONED AREA: Assay Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Ma (kg
Metal	Enriched	Impure Coated with graphite	B0	Other-specify Cabinet	14	1	

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

Seal leaked during handling on 12/7/92. Source was placed inside a shoe scuff, then a plastic rad bag by a Rad Control Tech. Later the bag was placed inside a 1-gallon compression sealed can and security sealed by Source Control personnel

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[ ] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

06/21/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.tiy:

Facility is over 50 years old. Potential cause for failure involve the handling/transfer of the HEU with additioinal causes of degradat the containers. Failure of personnel to follow procedure or human error could result in damage to systems and sources as the resu spill.

Inadequacy of Design Basis - Design basis of the building structure is unknown, Seismic and high wind capacity of the building ha been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94

Design Deficiency - Design basis of the buiilding structure is unknown, Seismic and high wind capacity of the building have not bee evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94

External:

Earthquakes, subsidence, and wind - Design basis of the buiilding structure is unknown, Seismic and high wind capacity of the bu have not been evaluated, and the soil has not been characterized per current DOE standards, DOE-STD-1020-94

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[ ] Contamination	[ ] Breach of Packaging	[ ] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 5: POTENTIAL EFFECTS

:ribe Each Effect Identified Above:

_ ..uctural failure- failure of the building during seismic event will not create a material release to the worker, environment or public.

SITE: Oak National Laboratory	FACILITY (Building or Location): Building 7824
	PARTITIONED AREA: Assay Area

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

The small amount of material present , the storage configuration, the form configuration, and the restrictions on handling, mean any effects will be small.

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7930
	FUNCTION: REDC

Question 1: SITE

Headquarters Facility Landlord:

Headquarters Program Sponsor:

Facility Age: 0

Design Life: 0

Location of Facility on Site and Distance to Site Boundary

Building 7930 is situated on the Oak Ridge Reservation at the 7900 area of ORNL approximately 8 miles from the population center of the city of Oak Ridge and about 1 mile southeast of the main ORNL complex. The facility is situated on a low ridge in Melton Valley. The nearest public access is Bethel Valley Road about 4900 ft to the north. The nearest residential area is about 13,500 ft to the southwest (see Fig 1).

Design Mission, Interim Mission, Current Use

Building 7930 is a heavily shielded hot-cell facility designed for remote operation using electro-mechanical manipulators. It was constructed in 1964-67 to develop and demonstrate methods for the remote refabrication of thorium and U-233 oxides into fuel for recycle back into a power reactor. However, the program was cancelled prior to the installation of any processing equipment and the building was never used for the purpose for which it was built. Over the years, several of the hot cells have been used various purposes. In 1987, an expansion was completed to include 252Cf Industrial Sales/Loan Program formerly carried out at Savannah River Site.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 7930
	FUNCTION: REDC

Question 1: SITE

:rational Status

operating

Historical Information

Occurrence Reports are:

ORO-MMES-X10BOPLANT-1994-003, 07/18/94, Fire alarm actuation causes building evacuation

ORO-MMES-X10REDC-1992-0008, 11/23/93, Loss of ventilation during scheduled maintenance work

ORO-MMES-X10REDC-1994-0004, 08/19/94, Personal injury due to excess pressure in Black Iron Waste Drum

ORO-MMES-X10REDC-1994-0007, 11/10/94, Personnel contamination while examining scanning electron microscope

ORO-MMES-X10REDC-1994-0009, Personnel contamination while performing maintenance in glovebox lab

ORO-MMES-X10REDC-1995-0004, Failure to meet OSR surveillance frequency requirement for loaded diesel generator test

ORO-MMES-X10REDC-1995-0008, Loss of building ventilation during planned maintenance

ORO-MMES-X10REDC-1996-0001, Building evacuation due to airborn contamination monitor alarms

Other Regulatory Concerns: None Identified

DNFSB Concerns: None Identified

List Authorization Basis

Basis for Interim Operation (BIO) approved (1996)

Describe Important or Unique Design Features

The building is completely protected by an automatic wet-pipe sprinkler system. Cell "C" is protected with automatic "flow ·ntrol" type sprinklers supplied by the building wet-pipe sprinkler system. The fire alarm system sounds local evacuatiion horns sends a fire alarm signal to the on-site ORNL Fire Department.

Describe Weaknesses in the Design Basis

Structural Design

Steel frame

Partitioned Areas of HEU within facility

Hot Cell C

Counting Area in Lab 212

Description of Partitioned Areas

Hot Cell C

Counting Room in Lab 212 - HEU is stored in a "Fire King" cabinet which is UL listed as a Class 350 Insulated Records Container with a 1-hour fire resistance rating.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 7930
	FUNCTION:	REDC

Question 1: SITE

ount & Location of Hazardous Material Collocated or Commingled with HEU

Hot Cell C:
Cf
Acids Laboratory quantities

Counting Lab:
Asbestos insulation Laboratory quantities
Solvents Laboratory quantities

Process Material Transfers

On-Site Transportation

Staff Levels & Experience

e	Number of Employees	Average Experience	Rang
;ervision	3	29	20-3
7			
Technician	2	12	5
-19			

Applicable References
BIO: BIO/7930-CTD/OD R0 (1996)

ORNL DWG 91-7088

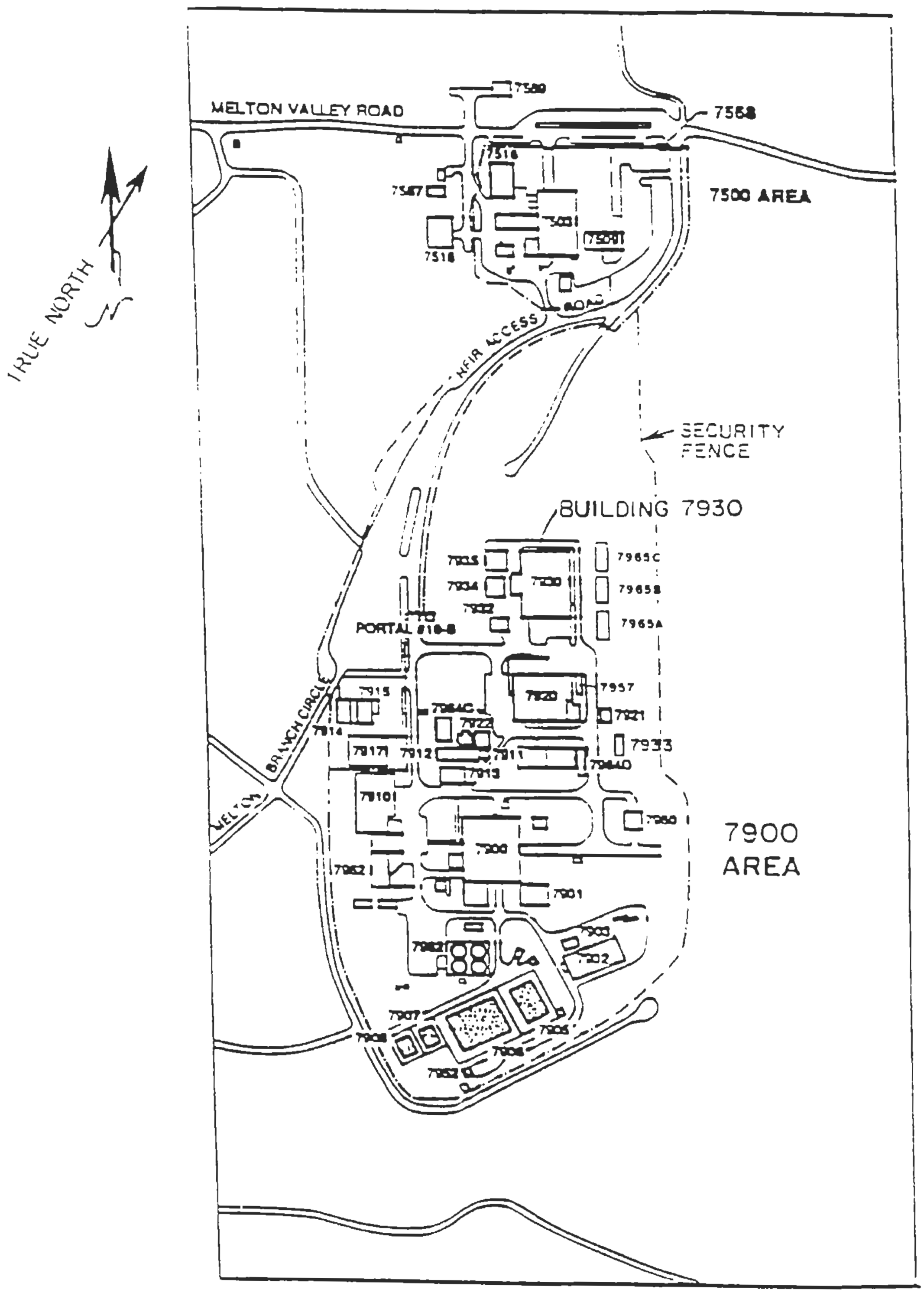


Fig. 2. Map showing the location of Building 7930 in the 7900 area.

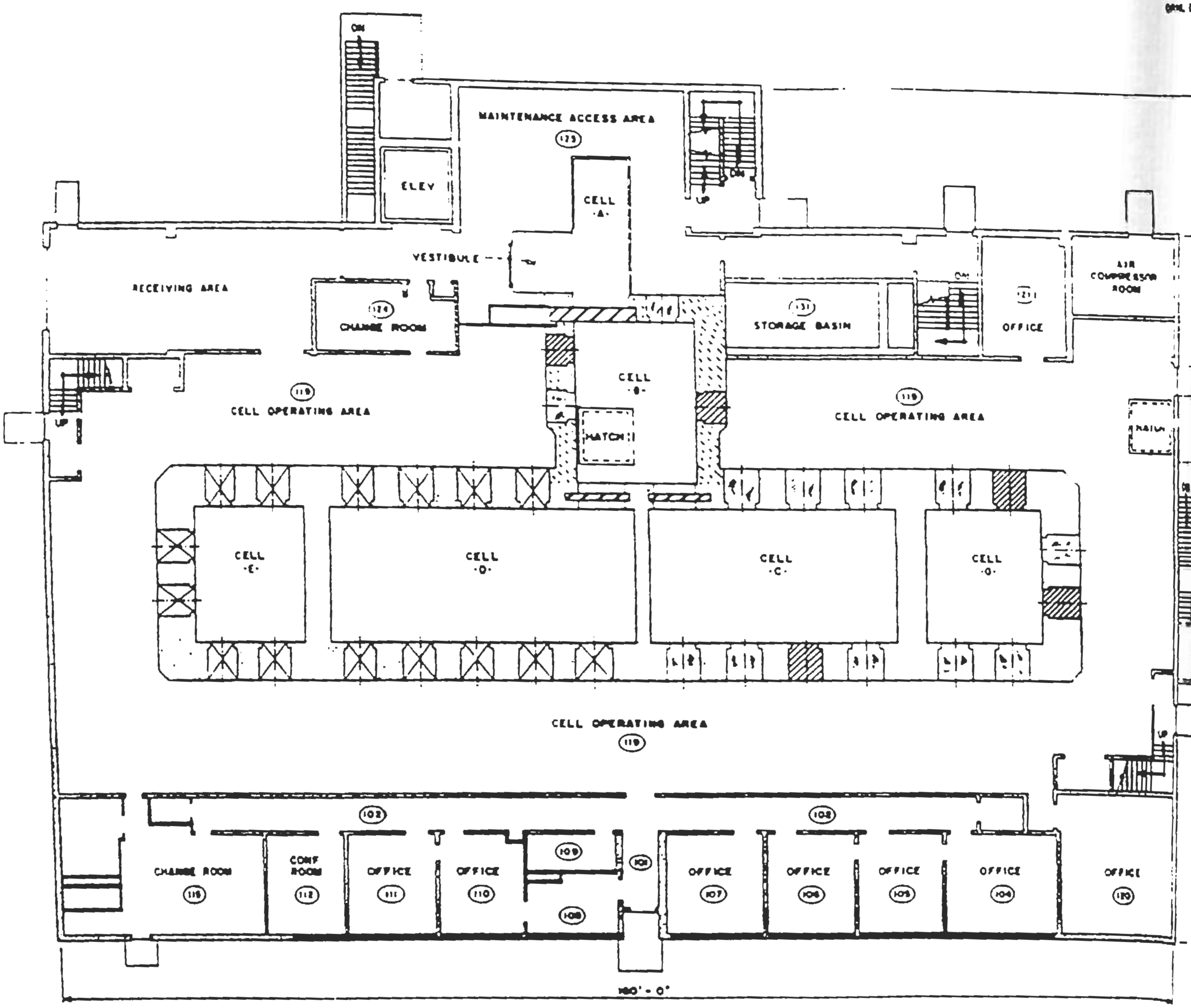


Fig. 3. Plan view of the first-floor level of Building 7930.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Hot Cell C

Question 2: BARRIER TYPES

·ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Hot Cell - Protects worker from contamination and radiation
Confinement System - Protects worker from contanimation
Alarm System - Protects worker by alerting to hazardous conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment and public from radiological and chemical hazards
HVAC/Confinement - Protects environment and public from radiological and chemical exposure during high consequence events
Site Boundary - Protects environment and public from radiological and chemical hazards
Fire Supression System - Protects environment and public from radiological and chemical hazards
Alarm System - Protects environment and public from fire, radiological, and chemical hazards

Criticality Barrier Narrative:

Adr inistrative procedures limit the allowable fissionable material mass to less than the Facility Material Control Limit (FMCL). The FMCL is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen such that no credible combinatic of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Material limits are established for hoods and storage areas.
The authorization basis document is current and approved.
Records are maintained, systems are monitored and tested, and the building is inspected on a predetermined schedule.
W··rker access is controlled at the entrance to the partitioned areas.
uct of Operations has been established for facility .
.rgency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Hot Cell C

Question 4: POTENTIAL CAUSES

Facility

- [ ] Process Material Transfer
- [ ] Inadvertent Transfers
- [ ] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [ ] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [Y] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- Design Deficiency
- Flooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [ ] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [ ] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydrolovsis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperat
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transporta
- [ ] Adjacent Facility
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Hot Cell C

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.ity:

Inadequacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

Human error is possible but it is unlikely that personnel would remove fission chambers from the cell in error. Also, inattentive to alarm system alerting personnel to dangerous conditions.

Equipment failure could lead to the failure of the confinement system, but would not prevent personnel from stopping HEU operations.

External:

Earthquakes, subsidence, wind - Design basis of the building structure is unknown, seismic and high wind capacity have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-94.

SITE: Oak Ridge National Laboratory

FACILITY (Building or Location): Building [illegible]

PARTITIONED AREA: Hot Cell C

Questions: POTENTIAL ERRORS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of [illegible]
[ ] Explosion	[ ] Material Release	[x] Loss of [illegible]
[ ] Contamination	[ ] Breach of Packaging	[x] Release of [illegible]
[ ] Criticality	[ ] Fire	[ ] Radiation and Release from [illegible]
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[x] Structural Failure		
[ ] Equipment Failure		
[ ] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Hot Cell C

Question 5: POTENTIAL EFFECTS

:ribe Each Effect Identified Above:

... a seismic or high wind event, the hot cell may be buried under building rubble as a result of structural failure. The integrity of the e[illegible] t expected to become a potential contamination hazard

SITE: Oak I lational Laboratory

FACILITY (Building or Location):

PARTITIONED AREA: Hot Cell C

Question 6: **POTENTIAL CONSEQUENCES**

Effect	Worker			Environment			Public		
	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation
No vulnerability associated with material realease from hotwell to worker, environment or public

No analysis exist to show that a relaease of material due to Natural Phenomena is incredible (see Generic Vulnerability)

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Counting Area in Lab 212

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

.ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[Y] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[ ] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[ ] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[Y] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[ ] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[ ] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[ ] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[Y] Other-specify "Fire King" Safe			[ ] Other-specify
[ ] None			

'ers between HEU and worker.
iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Counting Area in Lab 212

Question 2: BARRIER TYPES

·ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Room, Hood - Protects worker from radiological and chemical hazards
Confinement System - protects worker from contamination
Safe - Protects worker from radiation

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment and public from radiological and chemical hazards
HVAC/Confinement - Protects environment and public from radiological and chemical exposure during high consequence events
Site Boundary - Protects environment and public from radiological and chemical hazards

Criticality Barrier Narrative:

Administrative procedures limit the allowable fissionable material mass to less than the Facility Material Control Limit (FMCL). The FMC'_ is defined as the maximum amount of fissionable material that can be present in an ORNL facility or well-defined control area without formal NCS approval. For fissionable material, the FMCL is 250 grams. FMCLs are chosen such that no credible combinati of unplanned circumstances could lead to a criticality accident.

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures.
Personnel are trained to current procedures.
Material limits are established for hoods and storage areas.
The authorization is current and approved.
Records are maintained, systems are monitored and tested on a predetermined schedule.
Worker access is controlled at the entrance to the partitioned areas.
C· ·duct of Operations has been established for facility .
gency response is provided on a 24 hour per day basis.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Counting Area in Lab 212

Question 3: HEU Holdings and Packaging

...rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	P0, B1, G1	Other-specify "Fire King" Safe	5	1	0.0000

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Glass or bottles. plastic bagging used for containment and to prevent cross-contamination.

Describe material at risk, which constitutes a source term.

Material mass = < 0005 kg

SITE: Oak Ridge National Laboratory			FACILITY (Building or Location)				
			PARTITIONED AREA: Counting Area in Lab 212				
Question 3: HEU Holdings and Packaging							
..rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Alloys	G1, B1, G1	Other-specify "Fire King " Safe	5	1	0.00

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Glass or plastic bottles, plastic bagging used for containment and to prevent cross-contamination.

Describe material at risk, which constitutes a source term.

Material Mass = <.0005 kg

SITE: Oak Ridge National Laboratory

Question 3

...rial Form	Grade of HEU	Material Form Descripti...	...ge ...ge	No. of Packages
Oxides	Very Highly	Pure oxides Powder	5	1

.0000

...scr

Glass or plastic bottles, pl...

Describe material at risk...

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Counting Area in Lab 212

Question 3: HEU Holdings and Packaging

...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Other Wax	B1, G1	Other-specify "ire King" Safe	5	1	0.0050

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Glass or plastic bottles, plastic bagging used for containment and to prevent cross-contamination.

Describe material at risk, which constitutes a source term.

Mostly as oxide wires or oxide wax extrusion heel - materials for use in fabrication of neutron dosimeters.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Counting Area in Lab 212

Question 4: POTENTIAL CAUSES

Facility

- [ ] Process Material Transfer
- [ ] Inadvertent Transfers
- [ ] Aging/Degradation
- [Y] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [ ] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [ ] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [ ] Administrative Control
- [Y] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- [ ] Design Deficiency
- [ ] Flooding
- [Y] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [ ] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [ ] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydroloysis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperatu
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transportatio
- [ ] Adjacent Facility A
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930 PARTITIONED AREA: Counting Area in Lab 212

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	**Contamination**	**Exposure**	**Injury**	**Ground**	**Water**	**Air**	**Contamination**	**Exposure**	**Injury**
Material Release (Facility)									

Explanation

No vulnerability exists inside the file cabinet. After a sisemic event Health Physics technicans would survey the cabinet and area before workers were allowed to return, therfore contamination of the worker, environment, or public is very unlikely.

No analyses exists to show that a release of material due to Natural Phenomena as incredible (see Generic Vulnerability).

Applicable References

SITE: Oak Ridge National Laboratory

FACILITY (Building or Locatio[illegible]n): Building [illegible]

PARTITIONED AREA: Counting [illegible] Lab [illegible]

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

ility:

Inadequacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown, s[illegible] seismic [illegible] high wind capacity h[illegible] not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-ST[illegible] 1020-94.

This particular room is not protected with automatic sprinklers. A fire might spread beyond the incip[illegible] stage and could result in a fi[illegible] exposure to the HEU storage cabinet that exceeds the fire resistance rating of the cabinet.

Human error could result in the potential release of mateial. Equipment failure of HVAC/confinement [illegible] system should prevent per[illegible] from stopping HEU operations.

Exterior

Earthquakes, subsidence, wind - Design basis of the building structure is unknown, seismic and high [illegible] wind capacity have not been evaluated, and the soil has not been characterized per the current DOE standards, DOE-STD-1020-[illegible] 94.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Counting Area in Lab 212

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 7930
	PARTITIONED AREA: Counting Area in Lab 212

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

ıı a seismic or high wind event, the safe may be buried under building rubble as a result of structural failure. However, containers inside the insulated safe therefore material release will be retained inside the file cabinet.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	FUNCTION: FED

Question 1: SITE

Headquarters Facility Landlord: Energy Research

Headquarters Program Sponsor: Energy Research **Design Life:** 0

Facility Age: 47

Location of Facility on Site and Distance to Site Boundary

Building 9201-2 is located in the eastern part of the Y-12 Plant on Second Street directly south of the North Portal parking lot.

Design Mission, Interim Mission, Current Use

Fusion energy research is conducted in building 9201-2. It contains two major facilities; the Advanced Torodial Facility (ATF) and the Radio Frequency Test Facility (RTF). It also contains several minor facilities, and many laboratories, power supplies, shops, experiments, transmitters, and systems,

Operational Status

Operating

Historical Information

Occurrence Reports are:

ORO-MMES-X10CHEMTEC-1992-0014, 09/24/92, Company clothing contamination after working at 9201-2 at Y-12
ORO-MMES-X10FUSIONE-1990-0060, 11/29/90, Sprinkler systwem sprinkler activation
ORO-MMES-X10FUSIONE-1990-0374, 01/23/91, Discovery of radioactive contamination
ORO-MMES-X10FUSIONE-1991-0442, 12/31/91, Functional inadequancy in high pressure demineralized water system
ORO-MMES-X10FUSIONE-1991-1001, 01/08/92, Arc-over on magnetic field coil
ORO-MMES-X10FUSIONE-1991-1002, 01/14/92, Oil sheen observed on Upper East Fork Poplar Creek
ORO-MMES-X10FUSIONE-1991-1003, 01/14/92, Oil sheen observed on Upper East Fork Poplar Creek at outfall 55
RO-MMES-X10FUSIONE-1993-0001, 06/02/93, Contaminated wooden pallet and man-lift
D-MMES-X10FUSIONE-1993-0002, 06/03/93, Contaminated elevators

Other Regulatory Concerns: None Identified

DNFSB Concerns: None Identified

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	FUNCTION: FED

Question 1: SITE

: Authorization Basis

Hazard Screening approved (1992)

Describe Important or Unique Design Features

Describe Weaknesses in the Design Basis

Structural Design

Brick/cement block

Partitioned Areas of HEU within facility

HEU Storage Area

Description of Partitioned Areas

The HEU storage area consists of two locked cages and hot cell on the west side of the building. The HEU sources (fission chambers) are not presently used, but are left over from ATF experiments done several years ago. A total of twenty-eight gr... are contained in five fission chambers sitting on the floor in a locked storage cage on the first floor. Eight grams are contained... a source also sitting on the floor in another locked cage. Two grams are stored in a drum sitting on the floor in a hot cell in the same area, only accessible by a locked vault door.

Amount & Location of Hazardous Material Collocated or Commingled with HEU

hazardous material comingled with HEU

Process Material Transfers

On-Site Transportation

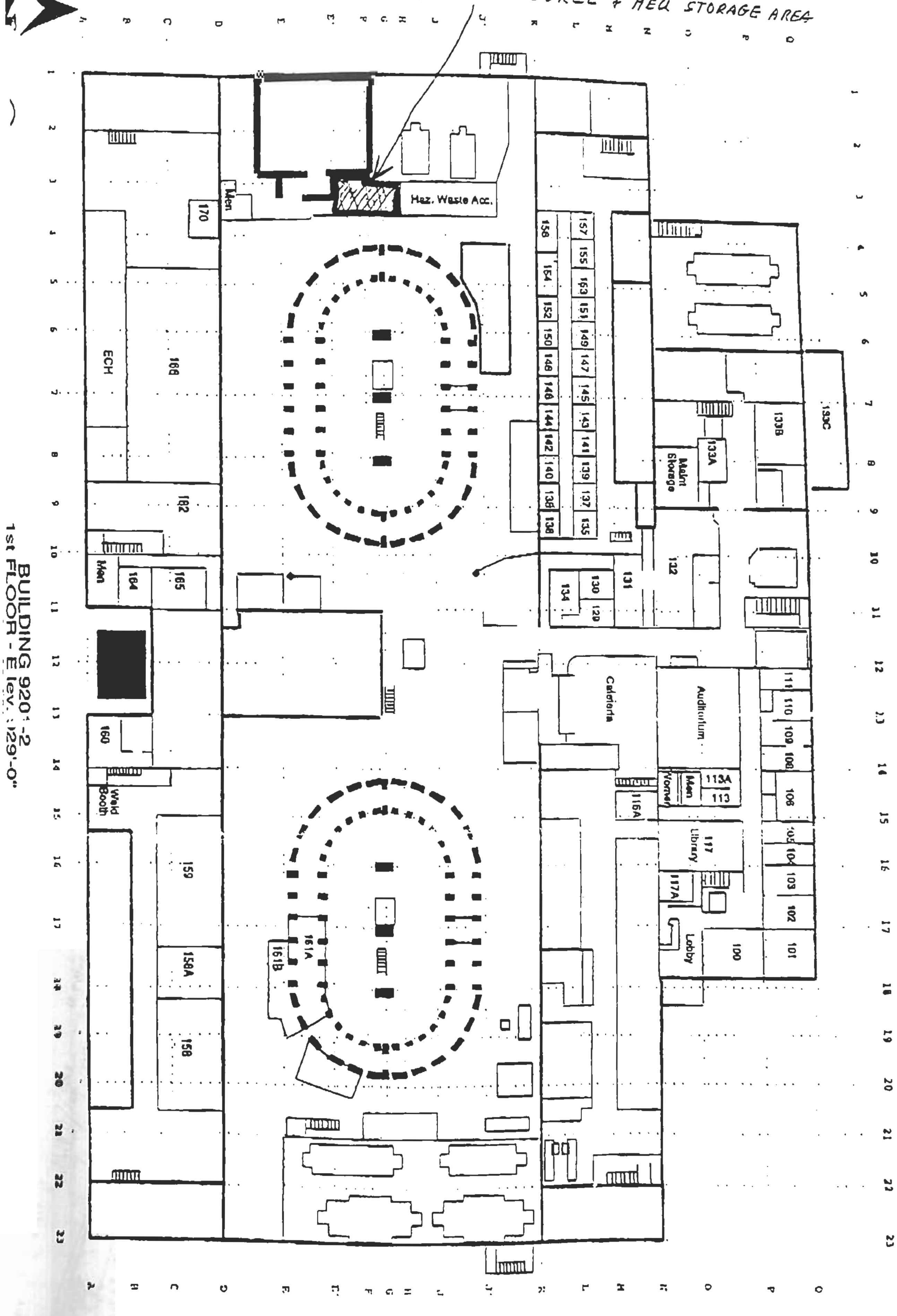
Staff Levels & Experience

Scientist	1	35	35
MBA Coordinator	1		

Applicable References

Hazard Screening: HS/9201-2/F/1/R1 (1992)

9201-2 SOURCE + HEU STORAGE AREA



SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

.ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. U.. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[ ] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[ ] HVAC/Confinement	[Y] Double Contingency Not Applied (specify) (e.g., Mass Absorbers Geometry Interaction Concentration Moderation Enrichment Reflection Volume)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike		[ ] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines		[ ] Configuration Control
[Y] Vault	[ ] Canyons		[ ] Quality Assurance
[Y] Room	[ ] Pads		[ ] Conduct of Operations
[Y] Hot Cell/Canyon	[Y] Site Boundary		[Y] Authorization Basis
[ ] Hood	[ ] Trenches		[Y] Training
[ ] Piping	[ ] Storage Vault		[ ] Organization
[ ] Shielding	[Y] Fire Suppression		[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System		[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[ ] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
[ ] Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[ ] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[ ] Other-specify			[ ] Other-specify
[ ] None			

'ers between HEU and worker.
.iers between HEU and public/environment.
3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

ng 9201-2

a

al hazards

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1	Other-specify Cage	Unknown	1	0.0040

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Brass container in pig and located in the north source cage.

Describe material at risk, which constitutes a source term.
U-235 is solid material inside brass container

11/26/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1, D1	Vault	10	1	0.0

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
stainless steel container inside 55 gallon drum in source vault; containment of material

Describe material at risk, which constitutes a source term.
U-235 plated on the inside surface of conatainer

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1	Other-specify Cage	10	1	0.0180

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Stainless steel container - containment of material

Describe material at risk, which constitutes a source term.
U-235 plated on the inside surface of container

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal			V1	Other-specify Cage	25	1	0.[illegible]

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Stainless steel - containment of material

Describe material at risk, which constitutes a source term.
U-235 material plated on inside of container

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1	Other-specify Cage	25	1	0.0020

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
stainless steel - containment of material

Describe material at risk, which constitutes a source term.
U-235 plated on the inside surface of container

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1	Other-specify Cage	25	1	0.002

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Stainless steel - containment of material

Describe material at risk, which constitutes a source term.

U-235 plated on the inside surface of container

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Sealed Sources	V1	Other-specify Cage	25	1	0.0020

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).
Stainless steel - containment of material

Describe material at risk, which constitutes a source term.
U-235 plated on the inside surface of container

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Building 9201-2

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SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 4: POTENTIAL CAUSES

Facility		Material		External	
	Process Material Transfer		Aging		Fire
	Inadvertent Transfers		Container Seal Degradation		Explosion
	Aging/Degradation		Pressurization	Y	Earthquakes
	Equipment Failure		Pyrophoricity	Y	Subsidence
	Change in Mission		Radioactivity	Y	Winds
	Other Collocated Hazards		Chemical Reactivity		Floods
	Corrosion/Embrittlement		Radiolysis		Extreme Temperature
	Inadequate Configuration Knowledge		Volumetric Expansion		Snow
	Combustible Loading		Oxidation		Ash Loading
	Inadequate Seals		Flammability		Aircraft Crash
	Water Sources		Toxicity		Vehicle Accident
	Inadequate Drains		Hydroloysis		Onsite Transporation
	Preventive Maintenance Failure		Crystallization		Adjacent Facility Accident
Y	Administrative Control		Other - Specify		Other-specify
Y	Human Error				
	Chemical Reactions				
	Contamination				
Y	Inadequacy of Design Basis				
	Design Deficiency				
	Flooding				
Y	Fire				
	Other SAR Accidents				
	Other-specify				

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[Y] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticality
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9201-2
	PARTITIONED AREA: HEU Storage Area

Question 5: POTENTIAL EFFECTS

ribe Each Effect Identified Above:

... a seismic or high wind structure failure, building collapse, could occur and possibly cause breach of containers integrity. Because these rooms are located in the interior of the building and HEU is in metal containers, material release to atmosphere is unlikely.

In the event of a fire the potential of a contamination or release of material, HEU, is highly unlikely due to the configuration in which the HEU is maintained.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 9204-3
	FUNCTION:	Isotope Enrichment &

Question 1: SITE

Headquarters Facility Landlord: NE

Headquarters Program Sponsor: NE

Design Life: 0

Facility Age: 52

Location of Facility on Site and Distance to Site Boundary

The Isotope Enrichment Facility (IEF) is located on the southern edge of the main Y-12 Plant, approximately in the middle of is east-west axis. It is further located in the extreme southeast corner of the Perimeter Intrusion Detection Assessment System (PIDAS) secure area. It is accessed by entering the protected area through Post 8 on First Street. The facility is bordered by Second Street to the north, East Poplar Creek to the south (runs underground at this location), and "E" and "G" roads to the east and west. This location is 730 m from the nearest public access on Bear Creek Road. (see Fig 1).

Design Mission, Interim Mission, Current Use

Building 9204-3 was originally designed and constructed as a calutron facility in 1943 for the enrichment of 235U. At that time the calutrons were used for the electromagnetic separation of stable isotopes which continues to the present. In 1962, a contained facility was constructed around eight calutrons to improve the safety of the enrichment and processing of alpha-emitting actinide isotopes. This contained facility was operated until 1979, when it was placed in safe standby and, currently, remains under surveillance as part of the Isotope Deactivation Project (EM). Glove-box laboratories are used on a limited basis to dispense small quantities of actinides for shipment to customers. The enrichment and processing of stable isotopes and the dispensing of actinide isotopes are part of the Isotope Production and Distribution Program.

SITE: Oak Ridge National L

204-3

al Status

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)	Building 9204-3
	FUNCTION:	Isotope Enrichment &

Question 1: SITE

ıount & Location of Hazardous Material Collocated or Commingled with HEU

Process Material Transfers

On-Site Transportation

Staff Levels & Experience

Supervisor	1	>15	>15
Group Leader	1	>15	>15
Chemists	3	>15	>15

Applicable References

Hazard Screening: HS/9204-3/F/IT-13/R0 (1992)

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Conversion Lab

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[Y] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass	[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines	Absorbers	[ ] Configuration Control
[ ] Vault	[ ] Canyons	Geometry	[ ] Quality Assurance
[Y] Room	[ ] Pads	Interaction	[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary	Concentration	[Y] Authorization Basis
[Y] Hood	[ ] Trenches	Moderation	[Y] Training
[ ] Piping	[ ] Storage Vault	Enrichment	[ ] Organization
[ ] Shielding	[Y] Fire Suppression	Reflection	[ ] Lessons-Learned
[ ] Distance	[Y] Alarm System	Volume)	[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[Y] Protective Clothing			[Y] Records
[ ] Remote Handling Confinement System			[ ] Standards
[ ] Burial Ground			[ ] External Regulation
[ ] Tanks			[Y] Surveillance
[Y] Alarm System			[ ] Personnel Reliability Assurance Program
[ ] Temporary Barriers			[Y] Worker/Access Occupancy Limits
[ ] Other-specify			[Y] Emgergency Response
[ ] None			[ ] Other-specify

ers between HEU and worker.

iers between HEU and public/environment.

3. *Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.*

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Conversion Lab

Question 2: BARRIER TYPES

·ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Confinement System, Gloveboxes , Hood - Protect worker from contamination
Room - Protects the worker from radiological and chemical hazards
Protective Clothing - Protect worker from contamination
Alarm System - Protects workers by alerting to hazardous conditions

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment and public from radiological and chemical hazards
HVAC/Confinement - Protects environment and public from radiological and chemical exposure during high consequence events.
Site Boundary- Protects environment and public from radiological and chemical hazards
Fire Suppression System - Protects environment and public from radiological and chemical hazards
Alarm System - Protects environment and public from fire, radiological, and chemical hazards

Criticality Barrier Narrative:

Double Contingency Applied - Nuclear Criticality Safety Approval (NCSA)

Administrative Barrier Narrative:

All operations are performed in accordance with written and approved procedures
Personnel are trained to current procedures
Material limits are established for materials
Authorization basis document is current and approved
Records are maintained, systems are monitored and tested, and building is inspected on a predetermined schedule
W'orker access to room is controlled
:able Conduct of Operations is in place
.gency response is provided on a 24 hour per day basis

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Conversion Lab

Question 3: HEU Holdings and Packaging

.erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Enriched	Pure oxides	G1, B1, SS	Other-specify Rm 116		0	0.0340

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, whicn constitutes a source term.

06/02/96

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):**
	PARTITIONED AREA: Conversion Lab

Question 4: POTENTIAL CAUSES

Facility

- [ ] rocess Material Transfer
- [ ] Inadvertent Transfers
- [ ] Aging/Degradation
- [ ] Equipment Failure
- [ ] Change in Mission
- [ ] Other Collocated Hazards
- [ ] Corrosion/Embrittlement
- [ ] Inadequate Configuration Knowledge
- [ ] Combustible Loading
- [Y] Inadequate Seals
- [ ] Water Sources
- [ ] Inadequate Drains
- [ ] Preventive Maintenance Failure
- [Y] Administrative Control
- [Y] Human Error
- [ ] Chemical Reactions
- [ ] Contamination
- [Y] Inadequacy of Design Basis
- [Y] Design Deficiency
- [ ] ooding
- [ ] Fire
- [ ] Other SAR Accidents
- [ ] Other-specify

Material

- [ ] Aging
- [Y] Container Seal Degradation
- [ ] Pressurization
- [ ] Pyrophoricity
- [ ] Radioactivity
- [ ] Chemical Reactivity
- [ ] Radiolysis
- [ ] Volumetric Expansion
- [ ] Oxidation
- [ ] Flammability
- [ ] Toxicity
- [ ] Hydrolovsis
- [ ] Crystallization
- [ ] Other - Specify

External

- [ ] Fire
- [ ] Explosion
- [Y] Earthquakes
- [Y] Subsidence
- [Y] Winds
- [ ] Floods
- [ ] Extreme Temperature
- [ ] Snow
- [ ] Ash Loading
- [ ] Aircraft Crash
- [ ] Vehicle Accident
- [ ] Onsite Transporation
- [ ] Adjacent Facility Accident
- [ ] Other-specify

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Conversion Lab

Question 4: POTENTIAL CAUSES

Describe Each Potential Cause Identified Above:

' is over 50 years. Potential cause for failure involve the handling/transter of the HEU with additional causes of degradation of the c.. .iners. A spill could be realized in the transfer process due to human error or failure to follow administraive controls.

Design basis of the building structure is unknown, seismic and high wind capacity of the building and HEPA filter equipment have not been evaluated to the current DOE standard, DOE-STD-1020-94 During seismic or high wind event the building can collapse, possibly breach containers integrity, and HEPA filter equipment failure.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Conversion Lab

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[Y] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[Y] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criiticality
[Y] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[Y] Equipment Failure		
[ ] Material Release		
[Y] Increased Radioactivity Level		
[ ] Other-specify		

ITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Conversion Lab

Question 5: POTENTIAL EFFECTS

Describe Each Effect Identified Above:

ty:

A leakage/spill would result in the contamination of the facility and increased radioactivity level due to the material release.

External:

In a seismic or high wind event the building can collapse and possibly cause breach of containers integrity , and HEPA filter equipment failure.

SITE: Oak F lational Laboratory	FACI .ITY (Building or Location):
	PART TIONED AREA: Conversion Lab

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	**Contamination**	**Exposure**	**Injury**	**Ground**	**Water**	**Air**	**Contamination**	**Exposure**	**Injury**
Leakage/Spills (Facility)	Y	Y							

Explanation

No analysis exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerabili y)

Applicable References

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3 PARTITIONED AREA: Uranium Lab

Question 2: What barriers are used to protect the workers, the public and environment from HEU?

.ch partitioned area identified in Question 1, list the facility barriers used to protect the worker and the public/environment. ..e below for identifying barriers. Multiple barriers usually employed should be noted.

BARRIER TYPES

Worker Barrier[1]	Public/Environmental Barrier[2]	Criticality[1,2]	Administrative Barrier[3]
[ ] Gloveboxes	[Y] Facility/Building Boundary	[Y] Double Contingency Applied	[Y] Procedure: Operation, Maint.
[ ] Transfer System	[Y] HVAC/Confinement	[ ] Double Contingency Not Applied (specify)	[Y] Material Limts
[ ] Duct	[ ] Liquid Containment/Dike	(e.g., Mass	[Y] Monitoring
[ ] Filter	[ ] Bay, Cells, Magazines	Absorbers	[ ] Configuration Control
[ ] Vault	[ ] Canyons	Geometry	[Y] Quality Assurance
[Y] Room	[ ] Pads	Interaction	[Y] Conduct of Operations
[ ] Hot Cell/Canyon	[Y] Site Boundary	Concentration	[Y] Authorization Basis
[Y] Hood	[ ] Trenches	Moderation	[Y] Training
[ ] Piping	[ ] Storage Vault	Enrichment	[ ] Organization
[ ] Shielding	[Y] Fire Suppression	Reflection	[Y] Lessons-Learned
[ ] Distance	[Y] Alarm System	Volume)	[Y] Testing
[ ] Respiratory Protection	[ ] Other - Specify		[ ] Trending
[Y] Protective Clothing			[Y] Records
[ ] Remote Handling			[ ] Standards
Confinement System			[ ] External Regulation
[ ] Burial Ground			[Y] Surveillance
[ ] Tanks			[ ] Personnel Reliability Assurance Program
[ ] Alarm System			[Y] Worker/Access Occupancy Limits
[ ] Temporary Barriers			[Y] Emgergency Response
[Y] Other-specify Safe - UL listed "Class B" fire resistance rating by CMNA None			[ ] Other-specify

ers between HEU and worker.
.iers between HEU and public/environment.
3. Includes management controls. Temporary administrative requirements are included in Question 6 as compensatory measures.

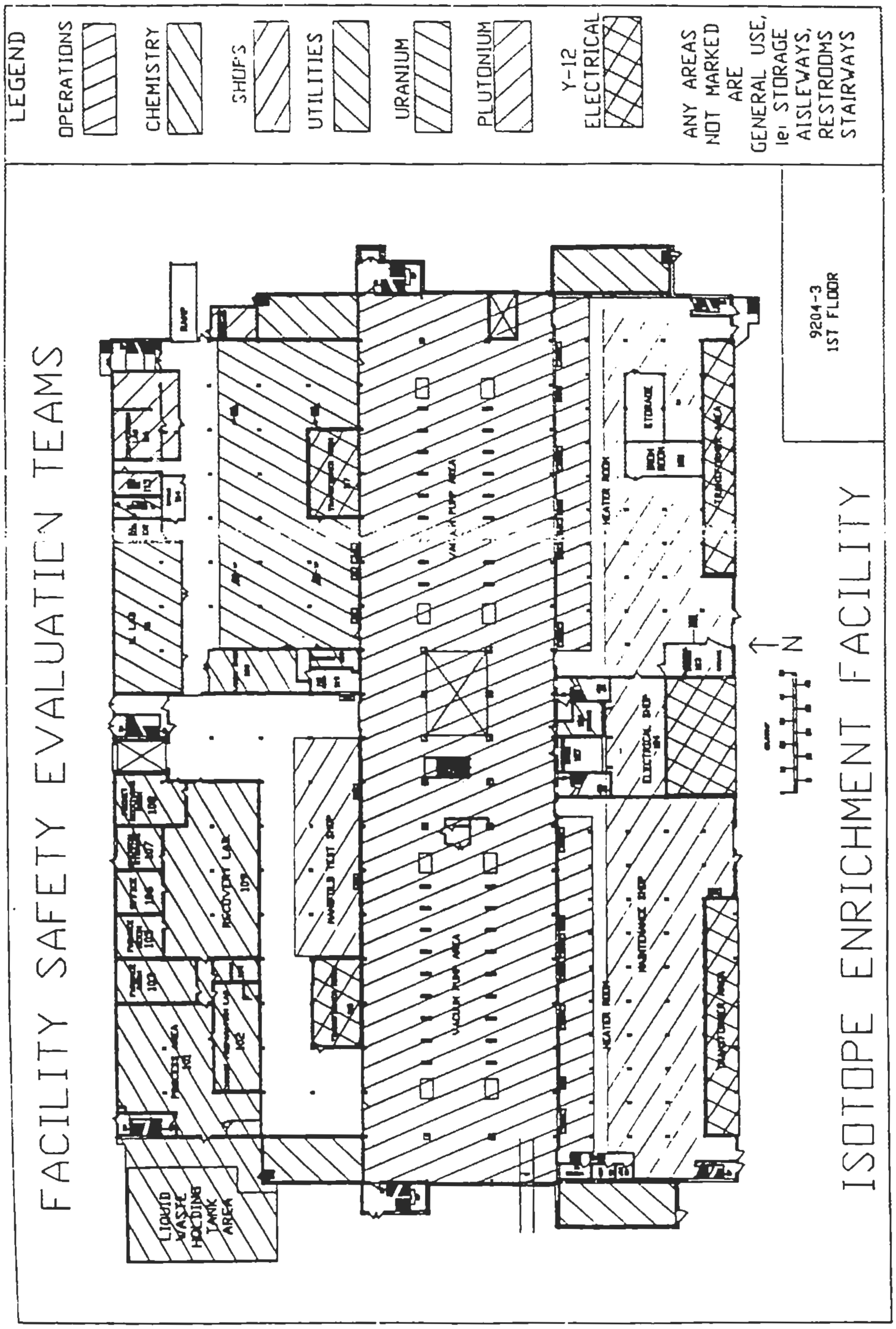

Figure 3.2-2 First Floor Plan - Building 9204-3

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Weapons	Pure metal	G1, B1	Other-specify Safe		2	0.0974

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	G1, B1	Other-specify Safe		1	0.0009

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

06/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

...erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Pure oxides		Other-specify Safe		1	0.0046

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

G1/P3/B1/C4 (6 items, 1 can)

Describe material at risk, which constitutes a source term.

TE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Pure oxides	P0, B1	Other-specify Safe		1	0.0004

umulative Inventory Differences

.0000

Describe packaging and its intended protective function(s).

P0/B1/C4 (2 items, 1 can)

Describe material at risk, which constitutes a source term.

06/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Oxides	Very Highly	Pure oxides	G1, B1, Can	Other-specify Safe		1	0.0008

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

06/02/96

E: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
mpounds	Very Highly	Other nitrate	P0, C0	Other-specify Safe		1	0.0000

mulative Inventory Differences

.0000

escribe packaging and its intended protective function(s).

escribe material at risk, which constitutes a source term.

06/02/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Lab

Question 3: HEU Holdings and Packaging

.erial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Compounds	Weapons	Other Nitrate	G1, C0	Other-specify Safe		1	0.0003

Cumulative Inventory Differences
0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Uranium Lab

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[Y] Container Seal Degradation	[ ] Explosion
[Y] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[Y] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[Y] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accident
[Y] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

06/21/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Uranium Lab

Question 4: POTENTIAL CAUSES

:ribe Each Potential Cause Identified Above:

.iity:

Facility is over 50 years old and many of the systems require high maintenace due to aging. Potential cause for barrier failures involve the handling/transfer of the HEU with additional causes of degradation of the containers. A spill could be realized in the transfer process due to human error or failure to follow administrative controls.

Inadequacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity of the building and HEPA filter equipment have not been evaluated to the current DOE standard, DOE-STD-1020-94.

External:

Earthquakes, subsidence, wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94.

Site: Oak Ridge

Facility

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Uranium Lab
Question 5: POTENTIAL EFFECTS	

D---ribe Each Effect Identified Above:

‹age/spill as a result of human error or breach of packaging could result in a material release and contamination of the lab.

In a seismic or high wind event the building can collapse and possibly cause breach of containers integrity , and HEPA filter equipment failure.

Question 6: POTENTIAL CONSEQUENCES

	Worker			Environment			Public		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release (Facility)									

Explanation

No analyses exist to show that a release of material due to Natural Phenomena is incredible (see Generic Vulnerability)

Applicable References

06/21/96

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Uranium Storage Vault

Question 2: BARRIER TYPES

ibe each barrier identified above and its intended protective functions.

Worker Barrier Narrative:

Room, containers - Protects the worker from radiation.

Public/Environment Barrier Narrative:

Facility/Building Boundary - Protects collocated workers, environment and public from radiological and chemical hazards.
Site Boundary - Protects environment and public from radiological and chemical hazards
Fire Suppression - Protects environment and public from radiological and chemical hazards

Criticality Barrier Narrative:

Double Contingency Applied - Approved Nuclear Criticality Safety Approval (NCSA)

Administrative Barrier Narrative:

Operations are performed in accordance with written and approved procedures
Personnel are trained to current procedures
Material limits are established for materials
Authorization basis document is current and approved
Records are maintained, systems are monitored and tested, and building is inspected on a predetermined schedule
Worker access to room is controlled
Applicable Conduct of Operations are in place
Emergency response is provided on a 24 hour per day basis

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Storage Vault

Question 3: HEU Holdings and Packaging

ᴲrial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
Metal	Very Highly	Pure metal	P1, B1, Pipe nip.,	Other-specify Room 113, Floor		1	0.0240

Cumulative Inventory Differences

0.0000

Describe packaging and its intended protective function(s).

Describe material at risk, which constitutes a source term.

:: Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Storage Vault

Question 3: HEU Holdings and Packaging

...ial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
::	Weapons	Pure metal	P1, B1, X3	Other-specify Rroom 113, Birdcage A		1	0.0143

...ulative Inventory Differences

...ibe packaging and its intended protective function(s).

...ibe material at risk, which constitutes a source term.

Oak Ridge National Laboratory	FACILITY (Building or Location)
	PARTITIONED AREA: Uranium Storage Vault

Question 3: HEU Holdings and Packaging

rial Form	Grade of HEU	Material Form Description	Packaging Types	Location	Range of Age	No. of Packages	Mass (kg)
	Weapons	Pure metal	G1, B1, styrene, pi	Other-specify Room 113, South Shelf		1	0.0009

lative Inventory Differences

)0

ribe packaging and its intended protective function(s).

ribe material at risk, which constitutes a source term.

06/02/96

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location):** Building 9204-3
	PARTITIONED AREA: Uranium Storage Vault

Question 4: POTENTIAL CAUSES

Facility	Material	External
[ ] Process Material Transfer	[ ] Aging	[ ] Fire
[ ] Inadvertent Transfers	[ ] Container Seal Degradation	[ ] Explosion
[ ] Aging/Degradation	[ ] Pressurization	[Y] Earthquakes
[ ] Equipment Failure	[ ] Pyrophoricity	[Y] Subsidence
[ ] Change in Mission	[ ] Radioactivity	[Y] Winds
[ ] Other Collocated Hazards	[ ] Chemical Reactivity	[ ] Floods
[ ] Corrosion/Embrittlement	[ ] Radiolysis	[ ] Extreme Temperature
[ ] Inadequate Configuration Knowledge	[ ] Volumetric Expansion	[ ] Snow
[ ] Combustible Loading	[ ] Oxidation	[ ] Ash Loading
[ ] Inadequate Seals	[ ] Flammability	[ ] Aircraft Crash
[ ] Water Sources	[ ] Toxicity	[ ] Vehicle Accident
[ ] Inadequate Drains	[ ] Hydroloysis	[ ] Onsite Transporation
[ ] Preventive Maintenance Failure	[ ] Crystallization	[ ] Adjacent Facility Accide
[Y] Administrative Control	[ ] Other - Specify	[ ] Other-specify
[Y] Human Error		
[ ] Chemical Reactions		
[ ] Contamination		
[Y] Inadequacy of Design Basis		
Design Deficiency		
Flooding		
[ ] Fire		
[ ] Other SAR Accidents		
[ ] Other-specify		

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location): Building 9204-3
	PARTITIONED AREA: Uranium Storage Vault

Question 4: POTENTIAL CAUSES

ribe Each Potential Cause Identified Above:

.ity:
Facility is over 50 years old. Potential cause for failure involve the handling/transter of the HEU with additional causes of degradation of the containers. A spill could be realized in the transfer process due to human error or failure to follow administrative controls.

Inadequacy of Design Basis, Design Deficiency - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94.

External:
Earthquakes, subsidence, wind - Design basis of the building structure is unknown, seismic and high wind capacity of the building have not been evaluated, and the soil has not been characterized to the current DOE standard, DOE-STD-1020-94.

E: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Uranium Storage Vault

Question 5: POTENTIAL EFFECTS

Facility	Material	External
[ ] Fire	[ ] Criticality	[ ] Loss of Site Integrity
[ ] Explosion	[ ] Material Release	[Y] Loss of Building Integrity
[Y] Contamination	[ ] Breach of Packaging	[Y] Release of Materials
[ ] Criticality	[ ] Fire	[ ] Radiation and Releases from Criticalty
[ ] Leakage/Spills	[ ] Other-specify	
[ ] Other Accidents-specify		
[Y] Structural Failure		
[ ] Equipment Failure		
[Y] Material Release		
[ ] Increased Radioactivity Level		
[ ] Other-specify		

06

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location):
	PARTITIONED AREA: Uranium Storage Vault

Question 5: POTENTIAL EFFECTS

D· ·ribe Each Effect Identified Above:

·eismic or high wind event the building can collapse and possibly cause breach of containers integrity resulting in a material release ·. contamination

Question 7: Site Summary

Site: Oak Ridge National Laboratory

Provide an overall assessment of the site ES&H vulnerabilities.

.portant ES&H Concerns

Building 3027 - An ES&H concern is the unknown packaging configuration of HEU holdings.

Building 3019 - Two major concerns (i.e. those posing a marginal or greater risk to the public, worker, or environment) are; 1) the unverified packaging condition of some of the HEU in the ventilated storge wells, 2) vulnerabilities associated with contaminated (with low concentrations of HEU) solution in the P-24 tank.

Building 3500 - At the time of the SAT's visit to this facility, five grams of U235 powder were stored in a glass vial within a locked cabinet. This caused a concern due to the potential breakage of the glass vial. Since that time, this glass vial has been repackaged to protect workers. Also, an ES&H concern was two fission chambers that were being kept unrestrained on a workbench.

Building 5505 - At the time of the SAT's visit to this facility, HEU in the form of liquid solutions were stored in glass vials on a elevated shelf(~7 feet high). This caused a concern due to the potential breakage of the glass vials. Since that time, the glass vials have been packaged in a metal can, eliminating this concern.

Description of HEU activities.

Storage and handling of highly radioactive U233 in buildng 3019 is the highest risk activities.

Current planned actions.

The material in Building 3019 storage wells is scheduled for inventory, package inspection, and repackaging as needed, ginning in 1998 or 1999.

It is eventually planned to seal the material in the P-24 tank in grout. No timetable has been scheduled for this action since the material is still valuable as a neutron posion.

Noteworth program or practices.

Access to partitioned areas strictly limited to authorized individuals and areas maintained under lock at all time was observed in the facilitites.

Building 3019 - The cited ES&H vulnerabilities exist within the confinement of ventilated cell structures. The unlikely event of a breach in primary containment barriers could only occur within the secondary confinement boundaries. Although some of the ventilation system components are aging, plans have been made and funding has been acquired to upgrade these components.

APPENDIX C

VULNERABILITY ASSESSMENT FORMS

Oak Ridge National Laboratory	FACILITY (Building or Location)
	VULNERABILITY NO. ORNL/Generic/SAT/001

1: Title of Vulnerability

...ic and wind capacity for structures at ORNL has not been evaluated

...t 2: Executive Summary

...nalysis exists to show that resistance against a material release due to natural phenomena meets DOE requirements. No ...ural Phenomena hazards analysis has been performed for each individual facility per the current DOE standard, ...-STD-1020-94. The HEU vulnerabilities for each individual facility assosciated with Natural Phenomena are unknown.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location)
	VULNERABILITY NO. ORNL/Generic/SAT/001

Vulnerability Assessment Form

ck 3: Vulnerability Description/Information

Material and material form	
Material at risk (give approximate mass (kg) and composition of material which may participate in the release - which is not necessarily the inventory of material at a given location).	0
Packaging type and number of packages	
Facility and other barrier	
Condition or weakness	

Block 4: Potential Causes and Effects of Barrier Failure

Structural failure of buildings during seismic or high wind event.

t - possible exposure of worker, environment, or public from material release.

ыock 5: Compensatory Measures

Perform evaluation per current DOE standard on Natural Phenomena.

Block 6: Possible Consequences

Exposure and contamination of worker, environment and public.

Oak Ridge National Laboratory	FACILITY (Building or Location)
	VULNERABILITY NO. ORNL/Generic/SAT/001

Vulnerability Assessment Form

7: Timeframe in which consequences of vulnerability might occur.

...d - likely to occur within the next 0-5 years

...c - not likely to occur during the facilities lifetime.

...8: Plans to mitigate or minimize potential vulnerability.

... necessary funding to implement DOE approved for performing Natural Pheneomenna evaluation of all identified ORNL ...ities.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/001

Block 1: Title of Vulnerability

...release in storage wells.

Block 2: Executive Summary

Due to long periods of storage, it is anticipated that corrosion could affect the containment ability of the cans. In one scenario, corrosion is assumed to cause a leak of powder in the storage wells. Another possibility is that fluorine and/or other elements are generated by radiolysis due to radiation effects of the materials inside the can. This can lead to an unpressurized release.

Neither case has been encountered with cans that have been previously removed from the storage wells.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/001

Vulnerability Assessment Form

`k 3: Vulnerability Description/Information

Material and material form	Oxides Impure Oxides
Material at risk (give approximate mass (kg) and composition of material which may participate in the release - which is not necessarily the inventory of material at a given location).	1.0000 1
Packaging type and number of packages	V1, B1, C0
Facility and other barrier	The Vessel Off Gas(VOG) system including roughing filters, HEPA filters and the 3020 stack.
Condition or weakness	1 kg is an upper limit in the amount of dispersable material. The packaging type and age are for a typical can in the storage wells.

Block 4: Potential Causes and Effects of Barrier Failure

Aging and corrosion of the cans or the material characteristics (radiation) may lead to a release.

Bl--k 5: Compensatory Measures

terial is in storage wells which would take away airborne particles from a leak via the VOG. The material would pass through rou..ing filters and HEPA filters before exiting out of the 3020 stack.

Block 6: Possible Consequences

None expected.

06/26/96

y Assessment F

ng or Location) Building 2019

NO. ORNL/2019/SAT/001

1999.

A complete inv

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location)** Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/001

Vulnerability Assessment Form

Bl· 10: Comments and references for parameter selection.

A ,onservative assumption would be catastrophic failure and spill of powder. Generally, corrosion is a gradual event. To date, no cans have shown signs of deterioration. Assuming 10% of the released powder reaches the VOG system is thought to be very conservative due to the tight fit of the shield plug located in the well over the cans. Once in the VOG system, the material would pass through roughing filters, HEPA filters, and the 3020 stack before being released.

J. T. Gordon
Signature, Team Member

6-28-96
Date

D. K. Rhyne, Jr.
Signature, Team Leader

6/28/96
Date

own) Building

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/002

Vulnerability Assessment Form

k 3: Vulnerability Description/Information

Material and material form	Oxides Impure Oxides
Material at risk (give approximate mass (kg) and composition of material which may participate in the release - which is not necessarily the inventory of material at a given location).	0.1690 0
Packaging type and number of packages	C0, B1, D2
Facility and other barrier	
Condition or weakness	169 grams is the total amount of U-233 in the lab area. Packaging type given for a typical can. Potential failure of HEPA filter equipment, ventilation lines, and collapse of

Block 4: Potential Causes and Effects of Barrier Failure

An earthquake or high wind may cause HEPA filter equipment failure and collapse of building. The resulting release of material can casue worker contamination.

[:: Compensatory Measures

Ev..ate HEPA filter equipment, ventilation lines, chimney stack and building to current DOE standards.

Block 6: Possible Consequences

Potential hazard to worker likely to happen during seismic or high wind event.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/002

Vulnerability Assessment Form

Block 7: Timeframe in which consequences of vulnerability might occur.

h... event is more likely to happen during life of the building. Seismic event or other disasters may not occur during facility lifetime.

Block 8: Plans to mitigate or minimize potential vulnerability.

ITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/002

Vulnerability Assessment Form

10: Comments and references for parameter selection.

T. Gordon
Signature, Team Member

D. K. Clingan, Jr.
Signature, Team Leader

6-28-96
Date

6/28/96
Date

06/26/96

Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/003

Title of Vulnerability

material from P-24 tank.

Executive Summary

the storage period of liquids in the BT storage tank, it may be necessary (due to leak in the tank) to pump the entire inventory adjoining tank or even a nearby temporary tank. During this operation, it is assumed that human error occurs and the transfer is unattended. A leak then develops and the entire contents undergoes a free-fall as it is being pumped.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/003

Vulnerability Assessment Form

`k 3: Vulnerability Description/Information

Material and material form	Solutions Nitric acid
Material at risk (give approximate mass (kg) and composition of material which may participate in the release - which is not necessarily the inventory of material at a given location).	0.1280 0
Packaging type and number of packages	T1
Facility and other barrier	The tank is in a concrete bunker equipped with a pump.
Condition or weakness	Amount of material listed is entire U-233 contents tank.

Block 4: Potential Causes and Effects of Barrier Failure

Material could be released if a leak developed during transfer of liquid from the tank.

[:: Compensatory Measures

Th. concrete bunker in which the tank is located is instrumented to detect leaks. Another tank of the same dimensions resides i bunker and could be available for material transfer.

Block 6: Possible Consequences

No facility worker injury due to assumption that the transfer is unattended (i.e., no worker present).

Oak Ridge National Laboratory

VULNERABILI...

Vulnerability Assessment Form

Timeframe in which consequences of vulnerability might occur.

...t is unlikely during facility lifetime.

...: Plans to mitigate or minimize potential vulnerability.

...ansfer of liquids from the tank should not be done unattended. Transfer of material occurs infrequently. Only 1 transfer was ... in 1995; no transfers have been made so far in 1996.

...sump

of P-24

the

SITE: Oak Ridge National Laboratory	**FACILITY (Building or Location)** Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/003

Vulnerability Assessment Form

B' 10: Comments and references for parameter selection.

A ervative assumption would be that all the liquid somehow makes it to White Oak Creek and a person downstream drinks 2 liters from the Clinch River where White Oak Creek enters the river.

J. T. Gordon
Signature, Team Member

6-28-96
Date

D. K. Rhyne Jr.
Signature, Team Leader

6/28/96
Date

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/004

B' ': Title of Vulnerability

Lo. . material in P-24 tank due to earthquake, tornado, or other disaster scenario

Block 2: Executive Summary

The concrete bunker around the P-24 tank have not been evaluated to the current DOE standards. This could cause containment failure.

SITE: Oak Ridge National Laboratory	FACILITY (Building or Location) Building 3019
	VULNERABILITY NO. ORNL/3019/SAT/004

Vulnerability Assessment Form

B' ': Timeframe in which consequences of vulnerability might occur.

Nu a high wind or seismic event is likely during the facility lifetime, although a high wind event is more likely to occur.

Block 8: Plans to mitigate or minimize potential vulnerability.

Plan to eventually seal material in P-24 tank in grout which will reduce the likelihood of release during a natural disaster. No schedule for these plans have been made since the material is still useful as a neutron poison.

APPENDIX D: REFERENCES

1. Individual Facility Authorization Bases (Basis for Interim Operations or Hazard Screenings)

2. Radiation Protection Program Manual, Oak Ridge National Laborat

3. Facility and Nuclear Criticality Safety Manual, February 28, 1994 Oak Ridge National Laboratory

4. Oak Ridge National Laboratory Nuclear Materials Control and Accountability Plan

5. X-10 Site Emergency Plan, Oak Ridge National Laboratory

6. Environmental, Safety and Health Compliance Administrative Procedures Manual, Oak Ridge National Laboratory

7. Individual Facility Fire Protection Engineering Assessment Repc